

Sandia to lead one of five 'Genomes to Life' programs

DOE announces five awards for \$103 million; Sandia to participate in two others

By Neal Singer

Sandia will lead one of five major research awards — and participate in two others — announced this week by the Department of Energy for what it terms “post-genomic” research.

Secretary of Energy Spencer Abraham announced the new projects, entitled “Genomes to Life,” in Washington Tuesday. They will total \$103 million over the next five years. Research will be conducted at six national laboratories, including Sandia; 16 universities and research hospitals; and four private research institutes. The work is headed by DOE’s Office of Science.

Said Abraham, “One could hardly imagine when the Energy Department began the human genome project in the ’80s that the resulting information and technologies could yield such diverse benefits.”

He said the new research program is expected to provide “biotechnology solutions to help produce clean energy, clean up the environment, and contribute to the President’s policy on climate change.”

The Sandia-led effort is headed by Grant Heffelfinger (1802) and involves \$19.1 million over three years to understand the sequestration of carbon in a seaborne bacteria called *Synechococcus*. The grant — subtitled “From Molecular Machines to Hierarchical Modeling” — brings together a formidable collection of research institutions, including Sandia, Oak Ridge National Laboratory, Lawrence Berkeley National Laboratory, Los Alamos National Laboratory, National Center for Genome Resources in Santa Fe, N.M., the University of California at San Diego, the University of Tennessee at

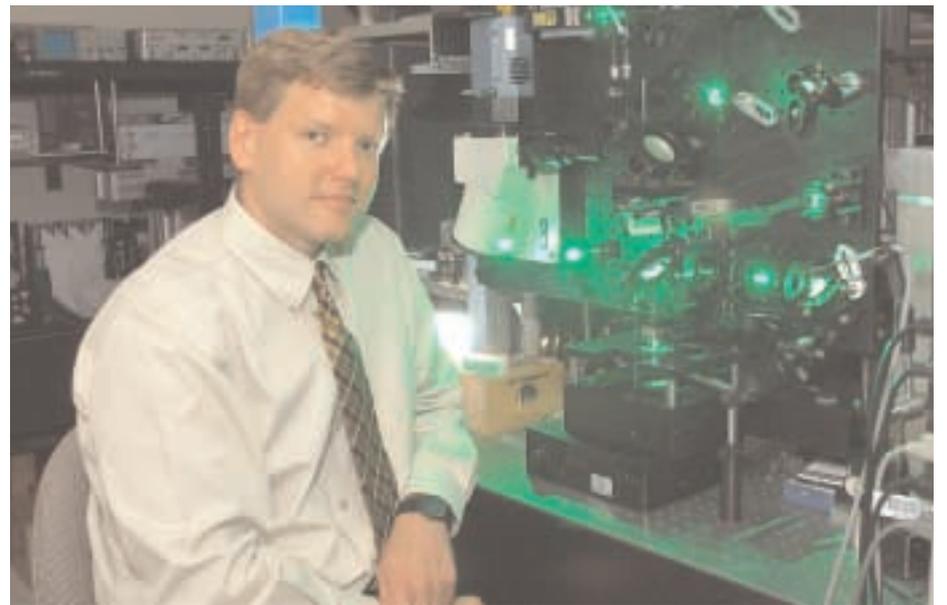
Knoxville, the University of Michigan at Ann Arbor, The Molecular Science Institute in Berkeley, Calif., the University of California at Santa Barbara, and the University of Illinois at Urbana-Champaign.

Of the total for this project, \$2.35 million comes to Sandia, with internal distribution of approximately \$1 million going to Computation, Computers, and Mathematics Center 9200; \$650,000 to Exploratory Systems and Development Center 8100, with the remaining \$500,000 to Materials and Process Sciences Center 1800.

Other research monies will be distributed among the ten partners.

The reason that Sandia — not particularly known for biological expertise — was awarded its leadership role, says Grant, is that “the Genomes to Life program is jointly sponsored by the Office of Science’s Office of Biological and Environmental Research and the Office of Advanced Scientific Computing Research.

“The Genomes to Life project has four goals,” he says: “to understand the molecular machines of life, regulatory networks, and how microbial communities work together. The final



GENOMES TO LIFE AWARD — Grant Heffelfinger (1802) will lead a \$19.1 million effort to study a seaborne bacteria, *Synechococcus*, as part of the DOE “Genomes to Life” project announced this week. Grant is sitting next to the hyperspectral microarray scanner built by Mike Sinclair, Jeri Timlin, Gary Jones, and Dave Haaland (all 1812), a key experimental capacity for the project. (Photo by Bill Doty)

goal is to develop computational capabilities to address the first three.

“So our proposal, though it has a biological title, is based on our world-class computing and experiment-analysis expertise — abilities we’ve proven time and time again. So it makes sense for Sandia to lead what I think of as the Genomes to Life program’s lead effort in goal 4.”

By the end of the project, Grant’s intent is to have “developed and prototyped a set of computational capabilities to enable the

(Continued on page 7)

Sandia pursues revolutionary approach to microsystems



SANDIA BIOTECH INITIATIVES — The *Lab News* continues its series of articles on Sandia’s initiatives in the biotech arena. Read about the Molecular Integrated Microsystems grand challenge in Chris Burroughs’ story on page 6.

Barringer explosives-detection portals installed at CN Tower in Toronto

Three screening portals employing Sandia-developed explosives-detection technology are being used at the CN Tower in downtown Toronto, Canada, as part of that tourist attraction’s entry-point security process.

It is the first use of Sandia’s explosives-detection portal technology as a screening tool in a public setting.

Billed as the world’s tallest free-standing structure, the CN Tower is a 1,815-foot-tall spire with an observation deck, restaurants, and gift shop near the top, similar to the Seattle Space Needle. The tower overlooks the Toronto SkyDome, home of Major League Baseball’s Toronto Blue Jays.

It is the first use of Sandia’s explosives-detection portal technology as a screening tool in a public setting.

(Continued on page 4)

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Sandia and Kirtland testing existing and new arsenic-removal technologies at active well

Data to help communities sort out best ways to meet arsenic limit

By John German

By 2006, according to a recently finalized EPA regulation, US drinking water shall contain less than 10 parts per billion of arsenic, a naturally occurring element that is thought to cause cancer when ingested at higher concentrations over long periods of time.

Arsenic levels in water from thousands of municipal groundwater supplies in the US, particularly in the western US, exceed the new limit by tens of ppb. (The current limit is 50 ppb.)

Communities are looking for treatment technologies that might reduce the cost of complying with the new regulation.

This summer Sandia and Kirtland Air Force Base are operating one of a growing number of arsenic-removal test facilities in the country.

The results of field tests conducted here should have national implications. Data from the tests will be shared widely to help communities and other

water suppliers in their search for cost-effective arsenic-treatment technologies.

Measuring up

At a KAFB well station just inside the base’s Truman Gate, Sandia has designed and Kirtland has installed a filtration unit that allows the team to test a variety of existing and emerging technologies for extracting arsenic from drinking water, including several approaches recently developed at Sandia.

The well supplies some one million gallons per day, which is about one-fourth of the base’s average daily water needs. The arsenic content of Well 15 averages about 15 ppb.

“This is going to be an issue for us, so we thought it would be good to help Sandia with its field tests so they can have a look at the data from a real well,” says Pat Montano, KAFB Water Quality Program Manager.

The field tests began May 24. Portions of Well (Continued on page 5)

Walter Bauer and friends celebrate his 33 years at Sandia

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President Bush tours labs’ exhibits, praises scientists’ antiterror work

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What's What

Distinguishing between speed bumps and speed humps brought a couple of interesting contributions.

Gary Hoe (10846) says the difference is in the breadth. A speed bump is about as high as it is broad, he says, and is designed to be crossed at walking speed, whereas a speed hump is about as high as a speed bump but is much wider and designed to be crossed at 25-30 mph, allowing the vehicle's suspension to "settle down before going down the other side at the design speed."

But, then, Sandia Laboratory Federal Credit Union President and CEO Chris Jillson writes that a 0.7-mile stretch of road in his neighborhood has three bumps and four humps and that you can drive over the bumps faster than over the humps. This analysis is, he says, based on navigating the route at least twice a day. And he adds, incidentally, that the easier-to-cross bumps have been there for four years or so, while the bone-jarring humps were installed only after residents asked the county to resurface the road.

Two possibilities come immediately to mind. The humps could be the county's "so, you don't like the road? . . . well, take this!" Or maybe they were going to resurface the road but the Barber-Greene paving machine hiccuped violently four times, depositing .175-mile's worth of hot asphalt mix each time and scaring the operator so much that he refused to get back on to smooth out the road.

No? Well, visualize it. Even if it's not true, it's pretty funny.

* * *

And before we leave ambiguities, how many is a couple? . . . and a few? . . . and is "some" more than "several," as in "some months back" and "several months back?"

* * *

Merrill Jones (5743) retired earlier this month, and recalling his 54 years at Sandia during a retirement party, he talked at some length about how much communications have improved in recent years. He praised the value of the *Lab News*, *Sandia Daily News*, organization meetings, and the Internet, and said VPs, directors, and managers are all doing a better job of keeping Sandians informed about what is happening around the lab.

That's good news for management — to be told by someone with Sandia's entire existence as his pool of knowledge that they're doing a good job of keeping employees up to snuff on the lab's work. And we in the Media Relations & Communications group were especially flattered to be singled out.

* * *

For all of us who drive through one of the Kirtland AFB gates to and from work — and that should be all of us in New Mexico — the good news is that the congestion problem is going to get better. The bad news is: not soon. Security work at the gates and other road work has had us pulling our hair out (those of us who have hair) for several weeks, and the work is going to continue for a few months. Read more in the story at right.

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

Construction projects creating long lines at KAFB gates . . .

. . . And with other projects not yet started, the congestion will be with us for a while

In an appearance in Albuquerque some years ago, one-liner wizard Henny Youngman made a few choice comments about the ubiquitous orange barrels detouring drivers around dozens of road construction projects and quipped: "Albuquerque'll be a nice place if they ever get it finished."

Creeping along in lanes of traffic that sometimes seem to stretch back to where the day started, Sandians are beginning to feel the same way about driving onto and off of Kirtland AFB. The good news is that when it's all finished, traffic flow will be better overall; the bad news is that the Salvation Army bell ringers will be in place before it is finished.

Meanwhile, to update:

- The Wyoming Gate project, which has squeezed traffic flow to one lane in each direction while retractable security barriers called bollards are installed, is scheduled for completion July 31.

- The rebuilding of NCO Bypass and G Avenue from west of 14th Street to 18th Street — begun July 15 — is scheduled for completion by late August. The good news there is that detour routes, around base housing to the north for inbound traffic, are clearly marked and traffic flow is near normal.

South Gate disappointment

- People commuting from the south will not be happy to read this, but there are no plans to reopen the South Gate. Even though, as some have suggested, traffic congestion created by construction at the main base gates could be relieved to some extent by reopening the South Gate, that would require manpower needed to check IDs during the rush hours at the main gates.

- The Eubank Gate reconstruction project, scheduled to begin Aug. 15 and continue for 90 to 120 days, will provide four 12-foot-wide traffic lanes for inbound traffic through the north side of the Eubank Gate. The project also will include protective barriers for guards, a new security gate, a six-foot-wide sidewalk along the north side of the gate entrance, and a six-foot-wide bike lane on the road shoulders for both the inbound and outbound traffic lanes.

The Eubank Gate project is expected to cause delays during the morning commute due to new roadway paving, curb and gutter construction, and traffic striping. However, the bulk of the construction will be performed during off-hours to minimize congestion.

The gate project is being coordinated with the city's Eubank Boulevard widening project that will begin in September and last about a year. When completed, it will provide four inbound lanes and three outbound lanes at the gate, and allow for inbound and outbound traffic during all hours that the gate is open.

The city project will widen Eubank Boulevard — from Southern Boulevard to the gate — to six lanes and will include a 16-foot median with left turnbays at appropriate intersections, bike lanes on each side of the roadway, and pedestrian walkways.

The city will require the contractor to provide at least two lanes open to traffic both north and south at all times, except for short restrictions during non rush-hour periods.

— Howard Kercheval

Sandia Lab News



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Technology update on safeguards and security is Aug. 13-15

DOE's Office of Security (SO) will hold a DOE complex-wide Technology Update at Sandia Aug. 13-15. DOE/SO technology accomplishments by the seven national laboratories over the last five years in the areas of physical security and material control and accountability will be showcased.

All employees with an interest in the safeguards and security arena are invited to attend. The Technology Update is being coordinated by Security Systems and Technology Center 5800. Contact Danisha Peterson (dtpeter@sandia.gov) to register. All attendees must be preregistered.

OPQC school supplies drive under way until Aug. 2

The OPQC Community Outreach Team asks your help in providing some of the needy schools and their children with school supplies.

The drive began July 22 and will end Aug. 2. The supplies will be donated to the East San Jose, Eugene Field, and Armijo elementary schools and to the Homeless Project and Migrant Program, which falls under the Title I program. There are collection boxes scattered around Sandia, along with a list of items that are needed.

The drive was a great success last year. And those spearheading the drive — Theresa Chacon (14402), Monica Lovato-Padilla (14401), Diane McNabb (2000), and Sandy Milliman (15200) — ask Sandians to make it even better this year.

Sympathy

To Lori Carroll (3031) on the death of her stepmother, Rebecca Frei, April 27 and the death of her nephew, Patrick Mack, April 20.

To Melissa (9600) and Jim (2552) Barnett on the death of her father and his father-in-law, Eugene "Gene" Koenig, in Albuquerque, July 17.

Walter Bauer and friends celebrate his 33 years of Sandia science leadership, retirement as senior scientist

By Nancy Garcia

After retirement, Senior Scientist Walter Bauer (8704) plans to do more or less the same things, in the same office, as before. But he still marked the occasion by celebrating 33 years of science July 10, with commentary by current and former top brass, friends, and colleagues in a room ringed by historical displays.

Jay Davis, the former head of the Defense Threat Reduction Agency and retired fellow at Lawrence Livermore National Laboratory, commented, "My whole career has been bounded by Walter Bauer, bounded by his inspiration and affection." They met in the lobby of the Los Alamos Inn in 1974 and discovered they both

'Walter is for me the ultimate role model of a senior scientist at Sandia.'

— VP Mim John

spoke German and developed an enthusiasm for bicycling. Friends agreed the enthusiasm bordered on fanaticism for Walter.

"Everything Walter does, he does 150 percent," commented 8700 Director Rick Stulen.

At work, that has translated into launching broad new areas of research. Walter was an early proponent of hydrogen research investigations, which led to the California site creating the Tritium Research Facility and receiving responsibility for gas transfer systems to support LLNL. Fusion energy researchers, commented Engineering Materials & Mechanics Dept. 8703 Section Leader Ken Wilson, "still follow the roadmap that Walter largely laid out." Sandia's Center of Excellence in materials science research emerged from these research bents, pointing the organization toward more scientific research when it had primarily been an engineering support facility.

Being allotted research time on the Stanford Synchrotron Research Laboratory's beamline only on Christmas and New Year's led Walter to spearhead development of laser plasma sources.

Research using that equipment became central to Sandia's role in Strategic Defense Initiative (SDI) work. When Walter was tasked in the 1980s to head a panel on materials science, he changed the focus to microelectronics and materials because he realized the importance to the nation at a time when Japan was trouncing US competitiveness.

Leveraged from SDI advances were early collaborations that eventually led to the largest industry-government partnership in the Department of Energy, the \$250 million Extreme Ultraviolet Lithography project to demonstrate futuristic patterning smaller, more powerful microchips.

With praise for Walter's vision and convictions, California Laboratory VP Mim John (8000) commented, "Walter is for me the ultimate role model of a senior scientist at Sandia."

Former 8300 Director Jim King, who hired Walter, talked about their common experiences in occupied Europe, when Jim was in the service and Walter was a child in Austria, meeting Americans for the first time. "I don't know how many sticks of chewing gum or how much chocolate he cadged off the US tank drivers and the rest of the soldiers when they arrived at Walter's village," Jim reflected, "but I remember him telling me he was impressed by how kind they were after the German occupation."

George Thomas, a former Sandia manager,



ATTENDING THE celebration were Walter Bauer's 9-month-old grandson, Spencer Bauer (mentioned as a future recruitment prospect), and past California site VPs Tom Hunter, John Crawford, Tom Cook, and Dick Claassen, who joked that Walter had ruined the '70s-era dress code by wearing sandals on the record-hot day.

claimed to be the one person present who'd known Walter the longest. As a lab technician during his undergraduate days, George supported Walter's experiments at Argonne National Laboratory. Queried about hydrogen research by Walter prior to the event, he ended up putting together a poster for the historical display. George said he realized, "I'm still working for Walter — and I've been retired one-and-a-half years."

Kevin McCarty (8721) presented a parting gift that he claimed had been created by gods for Walter eons ago but only discovered recently by mere mortals in a high mountain wilderness — a rock shaped like a bike seat and inscribed for the occasion.

California Thunderbird award winners to visit site

By Nancy Garcia

Thanks to Sandia and Lockheed Martin, nine graduating seniors are pursuing their future plans with more than a high school diploma; they also received \$1,000 Thunderbird awards for overcoming adversity during their school years.

In its ninth year, the award recognizes students selected by their schools for the honor. The schools can opt to keep the award a surprise, only revealing it during graduation ceremonies. In addition to presentations at the local graduation ceremonies by representatives of Sandia, the students are invited on-site for a summertime luncheon and tour July 16. Besides eating with Sandia managers and staff, they will tour a Combustion Research Facility lab, a Micro and Nano Technologies Laboratory electron optics room, and the College Cyber Defenders group.

One winner, who wrote an essay on overcoming obstacles, described some of the changes she underwent when her family suffered a financial setback and she had to relinquish the one bright spot in her life — the horses that had been a life-long passion even when she was not performing well in school. She was also temporarily separated from her mother for the first time.

"I had to learn to deal with the loss of everything familiar to me," she wrote. "I was given a huge wake-up call about all the things I took for granted. . . . I was angry and miserable and made sure everybody knew it."

Sandia California News

Then a slow transformation occurred. Her hatred for school turned to acceptance, then to interest, challenge, and motivation. "The only way I learned," she said about changing priorities, "is by making my own mistakes and fixing them alone."

She brought her GPA up from .67 to 4.0, made honor roll, and feels like she has a better and more secure future, as well as happier family members and friends. "I have so much support in my life that I never knew was there," she remarked.

The award criteria also call for enhancing the lives of others.

One winner, an oldest sibling whose parents were often absent, eventually had to move with her baby to a homeless shelter to separate from the crises and limitations of the parents she loves.

Throughout the instability, however, she retained what her nominators described as a "sweet and giving character. What little she has she shares with others. She brings her baby's outgrown clothes to school for other teen moms to share. In her old dilapidated car she takes other students and their sick children to the doctor. She shows leadership in her dealings with others and

empathy for their problems even when some might think her problems are far greater." She also served as a peer educator and spoke about her experiences to middle school students as an advocate of abstinence.

On a wait list for low-income housing, she plans to become a nurse, knowing that "she can only depend on herself." The staff selected her for the surprise award from among several strong contenders because they agreed she was "absolutely the most deserving."

The other winners were likewise recognized for their choices and commitment to make their own decisions despite negative influences. Their challenges included difficulties receiving emotional or economic support from parents; juggling nearly full-time work with volunteer activities and homework; overcoming addiction and a juvenile record to become an inspiration to others; and participating in extracurricular activities despite chronic health concerns.

Their goals include helping others through a range of future occupations: veterinarian, music educator and therapist, correctional officer, and medical technician.

Their nominators acknowledged how the students had blossomed and become aware of their own worth and potential. "I strongly believe that an investment in [her] education is an investment in our future as well," one wrote. "[She] is one of those people who will make a difference in people's lives."

Russia trip leaves Paul Robinson upbeat about evolving US-Russian relationship

By Bill Murphy

Labs Director Paul Robinson, still excited about a recent trip to Moscow to participate in a conference observing 10 years of post-Cold War US-Russian cooperation on nuclear threat reduction and nonproliferation efforts, says he was impressed by clear indications that life in Russia is getting better.

And that improvement, perhaps not coincidentally, reflects the growing warmth of the once bitterly hostile relationship between the two post-World War II superpowers.

Paul has traveled to Russia many times in the past, both in his role as a laboratory director and previously as a senior US arms control negotiator. This trip, in late May, he saw something different. He likens Moscow circa 2002 to Prague or other Eastern European capitals. With its robust signs of commerce, its traffic, its colorful and energetic ambience, Moscow is emerging from the post-Soviet slump, he says. The society, in short, is finding its way into the 21st century community of nations.



PAUL ROBINSON

While Paul wasn't in Russia specifically for the concurrent Bush-Putin summit, he followed its progress and subsequent announcements closely. And he was very pleased with the outcome, which went well beyond the much-publicized agreement to mutually reduce nuclear weapons stockpiles.

Nuclear fuel cycle research

The Russian and American chief executives committed their two nations to working together to study various nuclear fuel cycle alternatives. The aim of the studies would be twofold: to reinvigorate the nuclear energy industry worldwide, and to make the nuclear materials from power plants more proliferation-proof.

"These are important questions that we [US and Russian labs] can work on together," Paul says. "It is, in fact, the case, that we do have things we can learn from each other. . . . This is the biggest role [for the national laboratories] coming out of a summit that I've ever seen."

Paul noted that during a meeting in Santa Fe in April between Russian and US laboratory directors (*Lab News*, May 3), participants agreed that a

"The biggest story coming out of the summit wasn't really about the [nuclear reduction] treaty. It was about energy, particularly about oil and gas. For some number of years, the Russians have needed hard currency. But what do they have to trade? They have oil and gas — enormous reserves of it."

new emphasis should be placed on counterterrorism R&D.

MPC&A 'outside the fence'

Specifically, he says, US researchers have been working with their Russian counterparts on technologies and techniques for the control, tracking, monitoring, protection, and accountability [MPC&A] of special nuclear materials within the Russian weapons complex. He says during the lab directors' meeting, "We asked, 'What if we added MPC&A outside the fences?' We suggested [that approach] to the Bush administration, and I'm pleased to say, they embraced the concept very enthusiastically, even including it as part of the summit package."

Paul says he was thrilled to hear President Bush state, during comments at the treaty-signing ceremony in Moscow, that the US and Russian governments' highest priority must be to keep the most dangerous weapons out of the hands of the world's most dangerous criminals.

"That is exactly what is motivating us," Paul says.

While the summit had tangible implications for Sandia's work, Paul was perhaps most excited by a summit outcome that has no immediate bearing on the Labs' work.

"The biggest story coming out of the summit wasn't really about the [nuclear reduction] treaty," Paul says. "It was about energy, particularly about oil and gas."

Paul explains the context: "For some number of years, the Russians have needed hard currency. But what do they have to trade? They have oil and gas — enormous reserves of it."

Being able to develop and sell their oil and gas to a reliable customer could mean a continuing infusion of capital. And that in turn, could invigorate other aspects of the Russian economy.



JUST PRIOR to Labs President C. Paul Robinson's arrival in Moscow to observe 10 years of Russian-US cooperation on nuclear materials control issues, US President George W. Bush and Russian President Vladimir Putin, meeting in the ceremonial St. Catherine's Room in the Kremlin, sign the "Treaty of Moscow," a 10-year treaty binding the nations to reduce their nuclear stockpiles by about two-thirds, to a range of 1,700 to 2,200.

(AP Photo by Tim Sloan)

The Bush-Putin summit agreement establishing a bilateral energy dialogue, Paul says, is the first step in a courtship that could ultimately become "a marriage made in heaven." A closer energy relationship between the US and Russia would reduce Western reliance on resources from the volatile Middle Eastern oil fields. That, in turn, would reduce OPEC's geopolitical clout.

"Wow," Paul says in sum, "it really would be a major shake-up in international relationships."

What actually brought Paul to Moscow was not the Putin-Bush summit, but a conference to commemorate 10 years of US-Russian cooperation launched by the Nunn-Lugar Cooperative Threat Reduction Act of 1992. That landmark legislation marked the beginning of efforts of the two Cold War rivals to work together to shape a safer post-Cold War world.

Ten years ago, Sen. Sam Nunn, D-Ga., now retired, and Sen. Richard Lugar, R-Ind., senior statesmen in the US Senate of their respective parties, sensed a moment, perhaps fleeting, of opportunity.

The Soviet Union had, quite abruptly and dramatically, imploded.

Nunn-Lugar . . . and Domenici

The generations-long Cold War was over, and with its passing, the threat of mutually assured destruction of the US and the Soviet Union receded. As the world breathed again — 40-plus years is a long time, after all, to hold your breath — a few seasoned hands on both sides of the now-collapsed Iron Curtain realized that the Soviet arsenal would need to be secured. It was clear that a closer bond between the US and Russia was vital and was, in fact, in both nations' long-term interests.

The Nunn-Lugar legislation provided the mechanism — and the funding — by which the groundwork for that relationship could be laid.

At the conference Sen. Pete Domenici, R-N.M., and Russian Andrei Kokoshin were honored as the first recipients of the NTI Nunn-Lugar Award. (NTI is the Nuclear Threat Initiative, a nonproliferation organization launched and financed by Ted Turner and chaired by retired Sen. Sam Nunn.) The two honorees were cited for their efforts to make the provisions and intent of the Nunn-Lugar legislation a reality, Kokoshin for planting the original seeds of the idea and Domenici for early, on-going, and unflagging efforts to advance the cause of cooperation on a wide range of issues.

In addition to Domenici, other key US participants at the conference included Sen. Jeff Bingman, D-N.M., Sen. Bob Graham, D-Fla., Sen. Barbara Mikulski, D-Md., and US Reps. Christopher Shays, R-Conn., and John Spratt, D-S.C.

Portals

(Continued from page 1)

Since late June three Barringer Instruments' SENTINEL II portals have been screening about 7,500 visitors per day (15,000 per day on weekends) at an average rate of about one person every 8 seconds for each portal.

The CN customer is reportedly very pleased with the units, says Kevin Linker (5848), Sandia project leader for the technology's development.

Sandia developed and licensed to Barringer the sample preconcentrator used in the SENTINEL II portal. The portal blows a puff of air over a person, dislodging chemical particles from the person's skin and clothing. From this large-volume air sample, the preconcentrator then traps particles and vapors and directs the concentrated chemical sample to Barringer's IONSCAN® detector for analysis.

The preconcentrator makes possible the detection of very low concentrations of explosives and other chemical compounds of inter-

est, says Kevin.

The US Transportation Security Administration is currently evaluating the Barringer portal, as well as a second-generation Sandia portal and several other explosives-detection technologies, for eventual use as airline-passenger screening tools at US airports.

— John German



CN TOWER in Toronto, Canada, is the first public setting to use the Sandia-developed screening portals.

Arsenic

(Continued from page 1)

15 water are being flowed periodically through columns of activated alumina, a commercially available sorbent the EPA has designated as one of the Best Available Technologies for removing arsenic from drinking water down to the sub 10 ppb range.

Sandia project leader Nadim Khandaker (6118) says it will take several weeks to determine how thoroughly the activated alumina strips arsenic from the water and how long before the alumina granules are too saturated to filter out arsenic below the 10 ppb limit.

Beyond the lab

Then, with the activated alumina performance data as a baseline, the team will begin putting other treatment technologies to the test.

Among the Sandia-developed approaches to be tested are Specific Anion Nanoengineered Sorbents (SANS) — a family of proprietary formulations of mixed metal oxides that remove arsenic from water by trapping it permanently within the SANS' chemical structures. SANS developers include Dave Teter, Pat Brady, Jim Krumhansl (all 6118), and Nadim (Lab News, March 9, 2001).



GETTING TO 10 PPB — Nadim Khandaker times a chemical treatment that removes arsenic from a water sample. As part of tests this summer, some Well 15 water is being flowed through several arsenic-removal media contained in the filtration equipment on the wall beside Nadim.

March 9, 2001).

In small-scale laboratory batch and column tests with water containing 300 ppb arsenic, the SANS material outperformed activated alumina by about a factor of ten.

"We need to try SANS at a real well with real

arsenic concentrations using real valves, pumps, etc.," says Nadim.

Well 15 water will be flowed through columns of granular SANS to verify whether the materials' performance scales up to real-world situations.

Two other sorbents developed by Bob Moore (6849) also will be tested — a stabilized metal hydroxide and a doped activated carbon, both of which trap arsenic on their surfaces.

Other contenders

Following the sorbent trials the team will test an improved approach to coagulation/microfiltration, a common method of removing arsenic from drinking water. (Essentially, coagulant materials dissolved in the water bond with arsenic, then clump together into larger particles that are filtered out.)

A SANS-like nanoengineered enhancing agent developed at Sandia will be added to conventional coagulants. In previous laboratory tests, small amounts of these SANS enhancers significantly improved the effectiveness of standard ferric chloride coagulants.

The approach could reduce the cost of arsenic removal, says Nadim.

Other Sandia approaches to be tested include nanoengineered calcium oxide and magnesium oxide enhancers that could reduce the cost of lime-softening water treatment approaches.

The plumbing equipment used for the field tests incorporates a modular design so many different technologies and approaches can be tested, says Nadim. The equipment will remain at the well station following this summer's test series for possible tests of future technologies.

National implications

The SANS and other Labs-developed treatment technologies have never been field tested before, says Nadim, so it's too early to predict the possible outcomes.

"Our small-scale experimentation and models tell us the SANS will significantly outperform



ARSENIC ANALYSIS — Pat Montano (left), Kirtland Air Force Base water quality program manager, and Sandia arsenic treatment project leader Nadim Khandaker (6118) test a water sample from Kirtland Well 15 for arsenic after the sample has been treated with a commercially available activated alumina sorbent. (Photos by Randy Montoya)

other approaches, but any engineer knows to wait for the data," he says. "The field tests will tell us how long a column of these is going to last in real water."

The data also will provide scientifically objective information about the performance of the Sandia technologies relative to commercial systems and might also help the team design future water-treatment systems, he says.

The field tests should have national and international implications, depending on how well the Sandia approaches perform, says Henry Westrich, Manager of Geochemistry Dept. 6118.

"This technology has the potential for dramatic reductions in water-treatment costs, especially for rural and small water utilities in the US and the world," he says.

Other project team members include Capt. Mike Dunlop and Mark Dalzell (both KAFB); Prof. Bruce Thompson and Greg Gartland (both University of New Mexico); Howard Anderson (6118), and Paul Baca (6245).

The field tests are funded through the Laboratory Directed Research and Development program and sponsored by Sandia's Water Initiative, which supports the development of technologies that make water supplies safe, secure, and sustainable.

MESA project steps forward, invisibly

Support utilities installed and buried; MDL upgrades begun

By Neal Singer

It's impossible to avoid the feeling "Some day, all this will be yours" as lab personnel host Sandians on a tour of the wide expanse of the impending \$463 million MESA complex.

That portion of the site stretching west of Bldg. 897, at the southeast corner of Area 1, is longer and wider than a football field. It also is currently as flat as one and entirely without vegetation — its heritage from previous service as Sandia's reapplications site and from the recent passage of bulldozers, trenchers, and front-end loaders. These have ripped open the earth to insert and then bury gas, electric, water, sewer, storm, and communications lines for this part of the massive complex.

To the east and middle of this area will sit two weapons integration facilities, one classified, with a total of 375 researchers. At the far west of the site will be the JCEL computing center — not formally part of MESA but central to the project's capabilities. At the south is the utility corridor, where some trees have been replanted and native vegetation will soon be reseeded.

Utility rerouting for the Microelectronics Development Laboratory's eastward extension — intended to increase its fabrication capabilities — has not yet been completed, with visible gashes and mounds of earth east of the building. The addition, called the Microfab



CONSTRUCTION WORKERS pour concrete in a trench at the future MESA site.

and Microlab, will house 274 researchers and be equipped to handle gallium arsenide and other compound semiconductors. It will replace the Compound Semiconductor Research Laboratory, slated to be torn down in 2005, says Dave Bailey (10810), deputy project manager for utilities and the Microfab and Microlab.

Ivory Alexander (1904), who leads the project's security and telecommunications efforts,

says antiterrorism strategies with four fundamental elements have been integrated into the buildings. These protection systems exceed traditional standards of Sandia building requirements. Features include enhanced structural strength to prevent progressive collapse of building walls, an enhanced perimeter standoff area and vehicle barrier protection system, blast-resistant glass for exterior windows, and a basic chem/bio detection infrastructure to permit later addition of chem/bio sensors "to make this a smart building." Ivory credits upgrades to inputs from DOE, Security Systems and Technology Center 5800, and Integrated Safety & Security Center 3100 with the MESA design team.

On the telecommunications side, he says, a communication security plan has been okayed by NNSA/DOE. "The arrangements represent an evolved telecommunications infrastructure over what's in place before," Ivory says. The communication system will provide access to high-end modeling and simulation of C-Plant and the ASCI computing environment for the MESA complex.

Project manager Bill Jenkins (1920) says construction work is proceeding on schedule. Utility installation is 85 percent complete and expected to be finished by October. Five systems upgrades in the MDL are in various

(Continued on page 8)

Molecular Integrated Microsystems grand challenge pursues revolutionary approach to microsystems

Next generation of microsystems will be like nothing anyone has ever seen

By Chris Burroughs

The next generation of microsystems may be like nothing anyone has ever seen.

Sandia researchers are pursuing a revolutionary approach to building microsystems in which functions found in biological and nanoscale systems are combined with manufacturable materials.

The ultimate result may be the first-ever programmable Molecular Integrated Microsystems (MIMS) devices that can be used for rapid chemical and biochemical analysis in sensors and encoded optical interconnects that can route optical energy on demand.

The research, funded as an internal Laboratory Directed Research and Development (LDRD) Grand Challenge, is led by Terry Michalske (1040) and Len Napolitano (8130).

"A programmable system is a new vision for microsystems," Terry says. "Our goal is to be able to reconfigure the architecture and tune the functions of microsystems, on-the-fly. This approach combines new developments in biotechnology and materials science to provide the methods needed to control materials and manipulate molecules at the nanometer scale. The ability to manipulate nanoscale structures is at the heart of the next revolution in programmable microsystems."

Over the past decade Sandia has taken a pioneering role in the movement from traditional macroscale components and devices to fully miniaturized engineering systems. However, Terry says that "we are now taking advantage of microscale addressability to locally control materials properties and molecular interactions within the microsystem itself."

The MIMS grand challenge was initiated two-and-one-half years ago with the goal of developing



the technical basis for the next generation of biochemical analysis and integrated optical microsystems. The biochemical analysis portion of the project is focused on new approaches to sort and separate small quantities of proteins in complex biochemical mixtures using the μ ProLab — Sandia's on-chip protein lab (see "Microchannels in chips speed protein sorting" below). The μ ProLab will preconcentrate dilute protein samples and do on-chip biochemical separations, similar to what Sandia's "chem-lab-on-a-chip," formally called μ Chemlab™, does with deadly chemicals.

"The ability to rapidly analyze protein signatures is a critical component of Sandia's approach for detecting and mitigating bio-threats," Len says. "Traditional methods for analyzing the protein signatures involve labor-intensive and time-consuming techniques such as multidimensional chemical separations. Using the technologies developed in the MIMS, the team has already demonstrated that key components of protein analyses can be completed in a matter of minutes."

The programmable optical interconnect objective of MIMS is to write new optical paths, "on demand." The MIMS team has already demonstrated the ability to route on-chip optical signals in a programmable fashion. This new capability to create optical connections has important implications for spectroscopic analysis in chip-based chemical and biological analysis and may lead to new ways to control the access of information in weapons systems or secure data networks.

Len notes that the MIMS project has already had several successes. The researchers can reconfigure a microfluid channel in real-time and can use electrical signals to manipulate proteins within those channels. In fact, some MIMS technologies are already licensed for commercial use while others are in various stages of negotiation.

"Our work over the past couple of years has brought us closer to our goal of building workable MIMS," Len says.

This fiscal year the goal is to build and demon-

strate complete architectures and use science understanding to extend and increase programmable capabilities.

The MIMS grand challenge project received high praise from its external advisory panel that is made up of members representing universities, National Institutes of Health, Department of Defense, National Science Foundation, and DOE. The panel noted that, "At this stage of the project you have a terrific technology. What you are doing with this program is important science and promising technology."

"We believe there have been some very significant accomplishments thus far," the panel said in a report. "Further, we were impressed with the talent of the technical people that presented to us, as well as your breadth of understanding of what others are doing in this field. We feel that you have the promise here to wow biologists."

Cast of characters

Leading the MIMS project are Terry Michalske (1040) and Len Napolitano (8130). Team members include Aidan Thompson (9235), Alan Burns (1140), George Bachand (1141), Anup Singh (8130), Barrett Potter Jr. (1846), Bruce Bunker (1140), Carolyn Matzke (1763), Darryl Sasaki (1140), David Wheeler (1764), Gregory Jamison (1846), Jeffrey Brinker (1846), Kelly Simmons Potter (1118), Mial Warren (5911), Ronald Manginell (1764), Shanalyn Kemme (1743), Shanalyn Kemme (1743), Stephen Casalnuovo (1744), Susan Brozik (1744), Tim Shepodd (8722), Daniel Throckmorton (8130), Jongyoon Han (8130), Brian Kirby (8358), Alex Artau (8722), Andy Walker (8130), Art Pontau (8358), Bowe Ellis (8111), Bob Hughes (1744), Rachel Sowell (8111), Noble Woo (8722), Matthew Blain (1764), Laura Pearson (8130), Joanne Volponi (8130), Jane Lamph (8111), June Liu (1140), Karl Wally (8111), Russell Elliott (11500), Marie Garcia (1030), and Ed Southwell (Perspectives, Inc.).

Microchannels in chips speed protein sorting

By Nancy Garcia

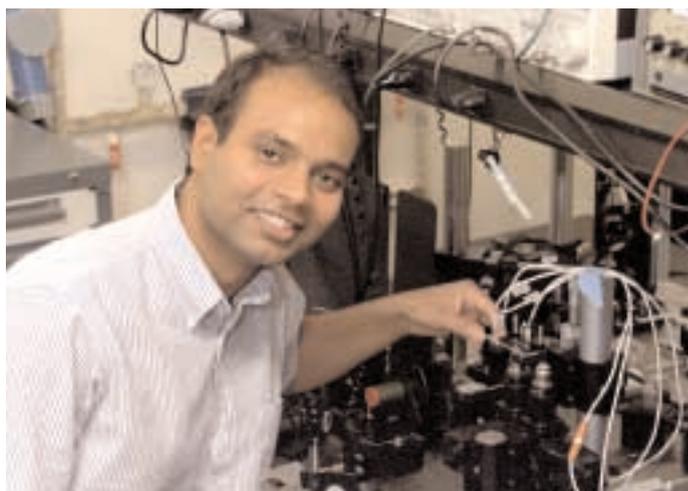
If a cell typically contains up to 10,000 to 100,000 proteins or subcomponent peptides, then just finding one, or discerning distinct identities of a few, can seem like looking for a proverbial needle in a haystack.

The task's all the harder if your starting material is hardly more than a few cells. Then, provided the target has been sorted out, how do you manipulate that bit to analyze it further? Standard screening currently requires cumbersome and lengthy processing steps using equipment the size of kitchen appliances.

Anup Singh (8130) and colleagues are developing microfabricated devices for protein and peptide analysis (dubbed a μ ProLab) through the Molecular Integrated Microsystems (MIMS) grand challenge Laboratory Directed Research and Development project.

They've found, Anup says, that "by miniaturizing, we can actually do better." Using microchannels a few centimeters long, and in some cases just a few millimeters long, on glass chips, they've demonstrated separation of six proteins and peptides in 45 seconds — one-tenth the time it would take if performed in longer capillaries, and with 1/1,000th the starting sample needed for laboratory-bench-top-scale separations using porous-matrix-filled tubes called chromatography columns.

Chromatography works by selectively delaying different groups of proteins for different lengths of time in the matrix as the sample, applied to the top like pouring a liquid into a funnel, is rinsed through the material with a



ILLUMINATING — Anup Singh uses this laser-induced fluorescence set-up to detect protein separations in microfluidic chips.

(Photo by Bud Pelletier)

buffered solution and collected in a row of vials at the bottom. Different types of proteins drip out at different times, forming isolated "peaks" in the collection vials.

Separations can be tailored to proteins' different physical properties, based on the material used for the spongelike sieving matrix and the liquid used to rinse it.

MIMS aims to integrate steps needed to sort and identify small amounts of proteins or peptides by "addressing" smart materials on chip assemblies to "do certain things at certain times in a certain place," Anup says. In addition to running chromatography and other separations at microscale, the chips will include components

such as valves to control and manipulate movement of fluids and concentrators to permit pre- and postanalysis concentration of dilute samples.

Anup hit upon his patent-applied preconcentrator invention by serendipity. He was working determinedly to get ready for a conference presentation. A minuscule, picoliter-sized protein sample he'd injected onto a microchannel that had been carefully packed with porous beads should have emerged, based on theory, after an electric field was applied. Anup suspected the initial sample injection didn't work. He used a hand-held syringe to push the fluid out of the channel. The detector happened to still be on, and to his surprise it registered a huge peak of concentrated protein.

"If not for that conference, I might not have discovered it," he says. "I was just working day and night."

He and collaborators termed the technique electrokinetic trapping. Sharp, concentrated peaks form by using an electric field to focus charged analytes into a small spot in the separation channel. The preconcentration technique is addressable and reversible; proteins can be trapped and concentrated at specific locations by turning the voltage on and released by turning the voltage off.

The investigators, including Tim Shepodd (8722), have created a new method of creating in place sieving gels by using ultraviolet light to polymerize a porous matrix whose composition can be fine-tuned for various separations. Select locations can be polymerized by using a mask.

(Continued on next page)

George Bachand explores ways to develop 'smart' materials that behave like living systems

Sandia's first molecular biologist seeks to design materials that have properties of living cells

By Chris Burroughs

Imagine a new "smart" material that can "heal" itself like a living system.

It may sound like science fiction, but to Sandia molecular biologist George Bachand (1141), such materials may be just around the research corner.

George is working with Jun Liu and Bruce Bunker (all 1141) and a team on a project called "Active Assembly of Dynamic and Adaptable Materials." Its goal is to identify and learn how to exploit key strategies used by living systems to develop materials that can be programmed to assemble and disassemble in controlled environments.

The project is funded by the Nanoscale Science, Engineering, and Technology Initiative through the DOE Office of Basic Energy Sciences.

"With this project we are attempting to break the walls between living and nonliving systems at the nano-scale," George says. "We are looking at designing materials that have properties of living cells."

Synthetic materials tend to have static structures and are not capable of adapting to a changing environment. In contrast, living systems have the ability to create, heal, reconfigure, and dismantle.

As part of the project, George, Bruce, Jun and the rest of the team are studying how to mimic the dynamic assembly and active transport of living systems in new materials.

Microchannels

(Continued from preceding page)

For controlling flow through a branching array of intersecting channels, Brian Kirby (8358) has used a moving plug of polymerized material to shuttle flow through a bypass, thus creating a sort of nonreturn, or check, valve.

The team intends to combine separation techniques to "fingerprint" proteins, as is currently done in bench-top processes, separating by both charge and size dimensions. Already, Anup and coworkers, including Jongyoon Han and Dan Throckmorton (8130), have seen separation efficiencies in a single dimension two to three times greater than the larger techniques allow.

"We hope to cut the time, overall, 10- to 100-fold," he says, "and work with a small sample — possibly a few cells." The ultimate goal is that, once sorted by charge and size, a spot of protein can be microfluidically transported to a mass spectrometer for analysis of its constituent elements — ideally through a completely automatic transfer when the device integration is complete.

"The research moves material sciences from static structures to a regime in which materials can be assembled and reconfigured in response to an external stimuli," George says.

With this understanding, a new generation of "smart," dynamic, and adaptable materials may emerge.

As a first step, the researchers plan to use or modify key components from living systems and integrate and control those components in artificial microfluidic environments.

Specifically, they will be looking at motor proteins — considered to be nature's means for transporting cargo within living cells — as the active components in the new dynamic nanomaterials. The species George is studying is kinesin, a linear motor protein that walks along fibers in a "hand-over-hand" fashion for hundreds of steps. Kinesin motor proteins are among the fastest and most efficient of motor proteins.

The motor proteins are grown in a Petri dish. Using a DNA sequence for a target protein, the specific gene that encodes the motor protein is isolated. The gene is placed into a nonpathogenic *Escherichia coli* strain where the motor protein is expressed and purified by liquid chromatography.

George became particularly familiar with motor proteins while working as a research professor at Cornell University. There, he as part of a team used motor proteins derived from adenosine triphosphate synthase (ATPase) enzymes to power a nano-nickel propeller in a solution. The entire device, including the motor and propeller on a nickel post, was comparable in size to some virus particles.

George joined Sandia last year, becoming the Labs' first molecular biologist. Besides working on the Active Assembly of Dynamic and Adaptable Materials project, he plans to continue his efforts in using living motor proteins to power nanoelectromechanical (NEMS) systems.

"Both research efforts will give us valuable understanding of motor proteins and how they work and a means for controlling the activity of proteins in synthetic systems," George says.

While George has cloned kinesin motor proteins in his lab, he still needs to characterize them to better understand how they bind and move. Over the next couple of years, he will perform biochemical and biophysical analyses of the motor proteins, which should provide him insight into the structural and mechanical features of the motor protein enzymes that are critical for conversion of chemical energy into mechanical motion.

He will also genetically engineer these proteins



GEORGE BACHAND'S LABORATORY in Bldg. 897 looks somewhat different from other labs in the building. He has Petri dishes in refrigerators growing bacterial cells that are used in his experiments. George is a molecular virologist — someone who works with DNA/RNA of viruses. He says Sandia has provided him a "great" environment for research. The reason, he says, is that to do biotechnology well, there must be a multidisciplinary team. "The diversity of staff here has led to some fantastic ideas," he says. (Photo by Bill Doty)

to survive in synthetic systems, as well as provide mechanisms to control motor functions such as starting/stopping and cargo pick-up/delivery.

George notes that if he and the other researchers can understand key design criteria used by living systems, they will be able to identify basic concepts that will allow them to develop artificial materials and systems that may ultimately surpass the survivability and functionality constraints of existing biological systems.

"This work holds the promise of opening up a completely new branch of material science in which the nanostructures that can be produced will only be limited by our imagination," George says.

Team members

Principal investigators for the Active Assembly of Dynamic and Adaptable Materials are George Bachand, Jun Liu, Darryl Sasaki, Bruce Bunker (all 1141), Gordon Osbourn (1011), and Professor Viola Vogel of the University of Washington. Contributors include Alan Burns (1141), Carolyn Matzke (1763), Mark Stevens, (9235), Jim Martin (1122), Henry Hess of the University of Washington, and William Woodruff of Los Alamos National Laboratory. The project coordinator is Terry Michalske (1040).

Genomes

(Continued from page 1)

advancement of life science research for DOE's missions, particularly in sequestration of carbon by *Synechococcus*.

Other projects in which Sandia is formally involved are led by:

- Oak Ridge, which received \$23.4 million over three years to develop a research program for identification and characterization of protein complexes, and

- Lawrence Berkeley National Laboratory, which received \$36.6 million over five years for rapid deduction of stress response pathways in metal/radionuclide reducing bacteria.

Further information on these projects will appear in later *Lab News* issues.

The awards are, without exception, for multi-institutional, multidisciplinary projects that involve both biological and computational sciences. Their purpose is to go beyond the workings of small groups of genes and instead focus on entire networks of genes and even entire biological systems. Single-celled organisms are first; later, more complex

creatures — including humans — will be studied.

The human genome and those of other organisms — microbes, plants, worms, and mice — are expected to provide new perspectives on the inner workings of biological systems.

The program will use advanced computation, genomic information, and other resources to "take advantage of solutions that nature has already devised to help solve problems in energy production, environmental cleanup, and carbon cycling," according to a DOE news release. "Through a systems approach to biology at the interface of the biological, physical, and computational sciences, the program seeks to understand entire living organisms and their interactions with the environment."

One goal of the Genomes to Life program is to understand molecular machines and their controls so well that they can be used and even redesigned to address national needs. (The concept is widespread that nature creates arrays of molecular machines with precise and efficient functions that include motion, molecular detection, chemical synthesis and degradation, and light emission and detection.)

The program is also expected to lead to an understanding of the complex regulatory networks

that control the assembly and coordinate the operations of these machines.

Another goal is to better understand the complex workings of microbial communities that could help solve energy and environmental challenges. These organisms normally do their work as part of communities made up of many different microbes. Eight types of microbes will be studied in these research projects because of their potential for bioremediation of metals and radionuclides, degradation of organic pollutants, production of hydrogen or sequestration of carbon, or because of their importance in ocean carbon cycling. All of these individual microbes have had their genetic sequence determined under DOE's Microbial Genome program.

The project's 10-year goal is to advance systems biology, computation, and technology to increase sources of biological-based energy; help understand the earth's carbon cycle, design ways to enhance carbon capture, and lead to cost-effective ways to clean up the environment.

Because these projects require sophisticated computational tools, new computational techniques to predict the functions and behaviors of complex biological systems are expected to be developed.

More information on the Genomes to Life program is available at <http://DOEGenomesToLife.org>.

Visionary Sandia RAMP program aims to ramp up regional manufacturing base — and Labs' options

By Bill Murphy

At the end of the day, Information Age or not, you still have to make stuff: silicon and steel still must be fashioned into things. Software runs on hardware. And nuclear weapons, as packed with information as they are, are more than ideas. They're made of things. They need to be manufactured.

In order to do the best possible job in the manufacturing aspects of stockpile stewardship, Sandia has launched the RAMP program, the brainchild of Lenny Martinez, VP for Manufacturing Systems, Science, and Technology Division 14000. RAMP, the Regional Alliance for Manufacturing Program, aims to create broad-based partnerships among Sandia and high-tech manufacturers and universities in the Southwest (New Mexico, Arizona, Utah, Colorado, and West Texas).

The goals of the partnerships are to boost Sandia's manufacturing capabilities, enhance the Labs' ability to extend its technologies into existing and new missions, and to create robust national — and transnational — centers of manufacturing excellence to enhance Sandia's supplier base.

In recent weeks, Sandia has signed Memorandums of Understanding with the Southern Arizona Industry and Aerospace Association (SAIAA) and with the University of Texas-El Paso. The MOUs spell out areas for cooperation and research that can benefit all signatories.

Although the Arizona-Sandia MOU was signed by SAIAA, it was actually a larger Tucson delegation that toured Sandia facilities last month. The group included Tucson mayor Bob Walkup, high-tech business owners, and representatives from the University of Arizona. At the time of the visit, RAMP manager Cesar Lombana (14011) told a reporter for the *Tucson Citizen*, "We think if we can develop a strong relationship with the University of Arizona College of Engineering we will develop



CESAR LOMBANA (right) gives a tour of Sandia's robotics laboratory to members of the Southern Arizona Industry and Aerospace Association, one of the organizations Sandia recently signed a memorandum of understanding with as part of the new Regional Alliance for Manufacturing Program (RAMP). (Photo by Randy Montoya)

The goals of the partnerships are to boost Sandia's manufacturing capabilities, enhance the Labs' ability to extend its technologies into existing and new missions, and to create robust national — and transnational — centers of manufacturing excellence to enhance Sandia's supplier base.

manufacturing solutions for the toughest manufacturing problems of the 21st century. That will make the region a very strong mecca for manufacturing research and development."

Lenny Martinez outlines the Sandia-specific manufacturing challenges of the new century: high-consequence, ultra-high reliability, low volume. That's a daunting suite of demands, some-

achievements, and agreed-upon amounts of money) for subprojects have been established with DOE, the project's overall baseline still has not been established, says Don Cook (1900), MESA program director. Don says this delay is standard procedure on large DOE projects. "We're working through processes with NNSA and DOE to complete the overall baseline by close of fiscal 2002."

"MESA will make our world safer," says Don. In addition to improving the standby and deliv-

ery systems of US weapons to take advantage of technology created during the era of Pentium chips, "We'll be able to offer to other countries, on a government-to-government basis, ways to make their bombs more secure."

A pedestrian mall will include landscaping, a water feature, and seating areas with a location for a future snack/coffee bar area located near the currently unused MDL parking lot. The mall and other MESA features are designed to give the project's 650 workers a place to communicate freely and share ideas.

thing that Lenny understands better than just about anyone. Lenny, who built an international reputation for his manufacturing prowess as a young executive with Digital Equipment Corporation, was brought aboard at Sandia to help shape DOE's post-Cold War manufacturing posture for the nuclear weapons complex.

The manufacturing challenge was not a trivial one. With the nation reducing its nuclear weapons stockpile levels radically and halting production of new weapons, the scale of the weapons manufacturing infrastructure likewise needed to be dramatically reduced. Thus, for instance, the Pinellas facility in Florida, DOE's long-time facility for making neutron generators and related components, was closed, its function transferred to Sandia.

Despite more than a little skepticism from some quarters, Sandia picked up the manufacturing mantle successfully and is now manufacturing WR-certified neutron generators. Lenny and a team of manufacturers oversaw that effort, which has integrated capabilities from several Sandia divisions.

RAMP is more than a program; it's a vision, Lenny's vision, of what the post-Cold War manufacturing environment in the NNSA should look like.

"We won't have suppliers in the traditional sense," Lenny says. "I'm talking about true partnerships." Increasingly, with the weapons complex scaling back, Lenny says, weapon components more and more are a "back room" job, not a company's primary business. "The people working on [weapons] parts are getting older; they're retiring. We're losing that

knowledge. So what I've tried to do is think through a new model, one in which we build a new critical core of people who care about the kind of manufacturing that we require."

Through RAMP, Lenny suggests, Sandia can be a catalyst, a focal point around which communities — academic and industrial — can build new capabilities, new relationships, and new synergies among themselves. And that, says Lenny, is good not just for the regional economy, but for the nuclear weapons complex, as well.

"We [the weapons complex] will increasingly have more viable make-buy options available as RAMP evolves," Lenny says.

While RAMP offers significant opportunities for Sandia and the weapons complex, the benefits don't stop there.

"In our analysis of the region," Lenny says, "what we find for the most part is low-level manufacturing, with a few high-tech exceptions, but we do find this strong academic backbone [i.e., a solid group of highly regarded universities in the region]. It's not unusual to find people from those universities in leadership positions around the country and the world. They offer a really decent backbone from an academic standpoint, and what we have at the top of that is two laboratories in New Mexico that are the best in the world at solving extremely complex kinds of technical problems. When you add up the region's strengths and potentials and you ask the question 'What kind of companies might be attracted to this region?' — well, the kind of companies who might want to come here are those that are doing higher value-added work. They want to work on tomorrow's products. And so, if I had a vision for where RAMP could lead, it would be that the region would be known as one of those spots that offers the best opportunity for a company to move their products up the value chain."

With the signing of the first RAMP MOUs and others to follow in due course, Lenny says, the vision is beginning to take shape.

"We're off to a good start," he says.

MESA

(Continued from page 5)

stages of completion. Work has physically begun to upgrade deionized water, acid exhaust, and specialty gas room capabilities. The deionized water upgrade is based on a High Efficiency Reverse Osmosis (HERO) system that is energy efficient. Procurement activities are under way to upgrade the chilled water processing loop to 600 gal/min, and to install a new emergency power system. Jim Beals is the deputy project manager for the MDL upgrades and the MDL retooling.

Most expensive are retooling activities in MDL, with \$81.8 million to be spent over two years. "It's a good market for tools," says Bill. "The tool market is cyclical and currently depressed, which makes it a good time to buy."

The breakdown: \$51 million to retool fabrication facilities for rad-hard (radiation-hardened) chips. Critical microsystems purchases account for the additional \$30.8 million. This year, Sandia received \$48.9 million to achieve a portion of these upgrades. The remainder of the money is expected next year, says Bill.

While baselines (which set scope, dates for

"MESA will make our world safer," says Don. In addition to improving the standby and delivery systems of US weapons to take advantage of technology created during the era of Pentium chips, "We'll be able to offer to other countries, on a government-to-government basis, ways to make their bombs more secure."

Daylong workshop explores range of future military involvement

Enhanced warrior becomes possible player in future wars, says analyst Andy Marshall

By Neal Singer

The reason Sandia VP and Principal Scientist Gerry Yonas spoke on July 11 at a one-day workshop on "The Revolution in Military Affairs" at the Patterson School of Diplomacy in Lexington, Ky., was to hear what Andy Marshall — another invited speaker — had to say about future wars, Gerry says.

Marshall, says Gerry, "is the guru of the new warfare." He is director of the Office of Net Assessment in the Office of the Secretary of Defense.

Gerry, head of Sandia's Advanced Concepts Group (16000), shared presentation of the opening session with Marshall. Marshall emphasized technology needs, and Gerry discussed prospects for technological advances.

Gerry offered the *Lab News* his own views, as well as ACG member Tim Moy's written notes, on the daylong series of talks at the University of Kentucky. Quotes on Marshall's major points are taken directly from Tim's notes, which were the official record of the meeting.

According to Marshall, the US didn't seek or plan to become the dominant military power in the world, but it is. "It's hard to find cases like this in military history," he said. "We currently have an astonishing position. This colors all deliberations of military R&D. And this came by happenstance, not something we sought. It was an accident of history." The Cold War, he said, resulted in a large military and large military budgets. The situation was atypical for the US, whose history was generally that of a small military enlarged only in wartime.

The future will require long-distance power projection with precision strikes rather than the use of a nearby friendly country as a base to defeat an enemy near it, because such bases will become harder and harder to arrange.

Another legacy of the Cold War is that the US today is also dominant in military investment. Though military funding is only 2.5 percent of US gross national product, the amount of money spent on defense "is larger than the GNP of all but 25 or 30 countries," he said. European countries have comparatively small militaries; Germany spends less than 1 percent of its GNP on military.

Unsought dominance

We have "unsought dominance," Marshall said. "No one wanted it, but few want to give it up." But because unplanned, it was not well thought-out, he said.

Among problems caused by US dominance is that potential adversaries are likely to rely on terrorism or "asymmetrical warfare" — a term Marshall dislikes because "the entire situation is so asymmetrical that it's misleading to call one kind

of military action this."

The future will require long-distance power projection with precision strikes rather than the use of a nearby friendly country as a base to defeat an enemy near it, because such bases will become harder and harder to arrange.

The world is also in a revolution driven by information, sensors, and other technologies. "The lesson has been, in the midst of such revolutions, you'd better be the one to get it right, both in terms of technology and doctrine." At the start of World War II, almost all major nations had the same technology, but the Germans had better concepts, organizations, and systems. "The rest of the world caught up quickly, but France lost its country in the meantime."

Know what drug your enemy is on

Warriors of the future may be provided with behavior-modifying drugs to enable them to fight fearlessly.

Amplified Gerry, "Amphetamines already are used by Air Force pilots to stay awake on long missions. When soldiers [in a recent European war] wouldn't massacre [their weaponless opponents], their leaders fed them alcohol and amphetamines until they did so. In the war of the future, you'll want to know what drug your enemy is on."

Understanding cognition and human behavior will be a major thrust of advanced military technology. Also vital to precision awareness will be networked sensors, robots, and high-performance computers.

War fighting will come to new places — like far undersea, because valuable assets like oil wells are being established on ocean floors, to outer space, and to underground facilities.

Gerry described how better-distributed sensor arrays — programmed to sense, decide, act, communicate (SDAC) — will prevent Americans from becoming helpless victims in future terrorist attacks.

They also should help minimize casualties to allies. Referring to a recent and (by reports) mistaken military action in Afghanistan, "Instead of waiting and bombing the wedding party, you go in ahead of time with multiple sensors and find they're buying flowers and baking cakes. You then entertain the possibility they're not going to be shooting off anti-aircraft weapons."

Against a dug-in military opponent, SDACS and robotics will defeat buried facilities, he said.

One barrier is data fusion and mining. "Right now, we're collecting noise and cannot find the signal." The problem is general, from 9/11 to the bombed Afghan wedding.

He envisioned nonlethal sonic or speed-of-light weapons for urban environments.

Poor, thirsty, cranky urban geezers

The revolution in technology, Gerry said, someday will combine social sciences with nano, bio, and info technology to create enhanced human capabilities. Better technology will help improve how people and societies eventually think, behave, and learn.

But large societal trends have an impact on technology, he said. "With water growing scarce, problems of rich versus poor, aging populations, and the worldwide trends of moves from rural areas to cities, what you will have are populations of poor, thirsty, cranky urban geezers. The needs of the geezers — not the military — will create the technology that the military will exploit."

The only way to victory over these problems is through "GUILT," he said: government, universities, industry, and laboratory teams working together.

However, closing speaker Harvey Sepulsky of MIT told his audience that academics seeking research money should look for it from the health-care industry, not the military. "I hate to be the skunk at the garden party," he said, but academics don't get along with military, and money available from the government will be increasingly focused on health care.

Gerry countered that universities could work with national labs as intermediaries between universities and the military.

Vital Crossroads: Sandian's book argues central role for Mediterranean in start of World War II

Most international historians present the outbreak of World War II as the result of an irreconcilable conflict between Germany and Great Britain. Cornell University Press has just published a book by Reynolds Salerno, a Sandia senior member of technical staff in International Security Initiatives Dept. 5324, that provides a somewhat different perspective.



REYNOLDS SALERNO

In *Vital Crossroads: Mediterranean Origins of the Second World War, 1935-1940* (2002, 312 pages, \$35), Ren

argues that this ubiquitous Anglo-German perspective fails to recognize complex causes and repercussions of international events, misappropriates historical responsibilities, and overlooks many global and imperial factors of the war's origins.

He shows how the situation in the Mediterranean played a decisive role in the European drama of the late 1930s and profoundly influenced the manner in which World War II unfolded. His study concentrates on the period from the Mediterranean crisis of 1935 to Italy's declaration of war in June 1940. In the book, he argues that the international politics of pre-World War II Europe — particularly in the Mediterranean — was a central concern for the European powers of the time and a fundamental reason why Europe went to war and why the war unfolded as it did.

Academic community responds

The book draws on Ren's access to and research in 28 archives in five different countries. One academic commentator says of Ren's book, "This is the way international history should be written." Another calls it "a remarkable piece of work, one that broadens and deepens our understanding of the origins of the Second World War. . . ." Another praises him for working extensively "from French and Italian archival material that has been relatively little used by historians who write primarily in English."

"It's a book of historical/international security studies, which was the focus of my graduate work," Ren tells the *Lab News*. (He received his PhD in history from Yale in 1997.) "Unlike a lot of my counter-bioterrorism work here, I can talk about some of this academic stuff. Not sure I can well describe how I got from the Second World War to bioterrorism, but . . ."

Ren says his first job out of graduate school was in the Department of Peacekeeping Operations at the United Nations in New York. He came to Sandia from the UN. — Ken Frazier



EUROPE IN 1944. Did the Allies' reluctance to take decisive action against Fascist Italy in 1939-40 contribute to the fall of France in 1940, Britain's desperate situation in 1940-41, and the post-war collapse of Britain as a world power? That's what Ren Salerno contends in *Vital Crossroads*.

Mileposts

New Mexico photos by Iris Aboytes
California photos by Bud Pelletier



Terry Bersie
40 8945



Roger Everett
40 8221



David Shirey
35 15252



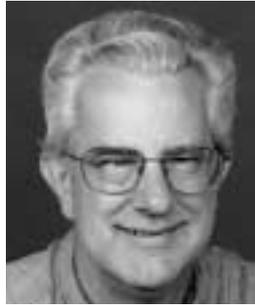
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L. Patrick Murphy
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George Novotny
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Steve Schwegel
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Robert Aragon
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Roger Assink
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John Stichman
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Tom Bergstresser
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Tom Carne
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Peter Chauvet
25 12326



Merri Lewis
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Ernest Padilla
25 2994



Bernie Cardell
20 15421



Lee Cunningham
20 12630



Anita Denton
20 10508



Nick Dereu
20 2111



Pamela Harris
20 6536



Bruce Levin
20 6113



Rita Shortman
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Terrance Smith
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Jake Deuel
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Frank Figueroa
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John Franklin
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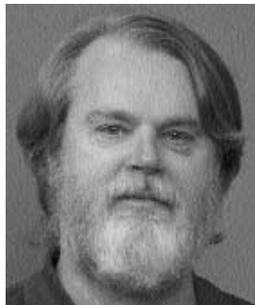
Michael Furnish
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Joselyne Gallegos
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Greg Haschke
15 2344



Edward Klaus
15 9334



Jerry Langheim
15 15200



Alan Pomplun
15 8990

Recent Retiree



James Provo
41 14402



Perry Robertson
15 1751



Scott Rowland
15 10824



Karen Smith
15 2500



Steve Yrene
15 5701

Recent Patents

William Breiland (3010): Temperature Determination Using Pyrometry.
Douglas Loy (6245), David Wheeler (1764), James McElhanon (8722), Randall Saunders, and Marvie-Lou Durbin-Voss: Method of Making Thermally Removable Polyurethanes.
Robert Brooks (1733): Adhesive Elastomeric Gel Impregnating Composition.
Keith Snyder (2955): Modular Shield.

Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

MISCELLANEOUS

SOFA, love seat, peach, white, light blue, green, wicker accents, good condition, \$49. Locher, 266-2021.

INDIA RUNNER, 10' x 2', light green (prints), value \$500, asking \$350; executive exercycle, 2-spnd. motor, \$100. Perez, 877-4682.

SNOWMOBILE OIL, Castrol, pre-mix, 1 case, & 12 N.G.K. sparkplugs for snowmobiles, \$35. Wright, 296-3850.

TRANSFORMER, 220V, 5-amp, primary, single phase, 20V, 40-amp, secondary, also operates on 110V, 15-amp circuit, \$15. Stamm, 255-2640.

TREADMILL, ProForm, 0-6 mph, \$50; Motobecane 10-spnd. road bike, \$30; Lawn Boy, self-propelled, \$85. Gluvna, 884-5251.

NORDICKTRACK, like-new skier, used very little, \$200. Hamburg, 857-9662.

RECLINER COUCH, leather, dark green, w/middle drink console, 6 mos. old, originally \$1,400, asking \$850. Barnes, 922-1281.

BABY DUCKS & bunnies, \$5 ea. Lopez, 452-0426.

DVD PLAYER, Sanyo, home set-top player, works great, have to sell to get DVD-R compatibility, \$50. Ennis, 301-6228.

WASHER/DRYER, stacked, Speed Queen, full-size, \$300; guitar, case & tuner, \$125; burgundy Barnhardt love seat, \$150. Jones, 296-2796.

CHIPPER/SHREDDER, 10-hp, great for cleaning up yard debris, like new, paid \$590, asking \$300. Schroen, 286-1428.

CARDIO GLIDE, \$75; custom framed Statue of Liberty picture, \$45. Smith, 898-8429.

JACUZZI, Hot Spring Spa, top of the line in '85, 6 1/4' x 7 1/2', great condition, \$1,500. George, 798-9329.

RIMS, 16-in., '97 Mustang GT, new tires, great condition, \$450 OBO; Suburban 3rd seat, excellent, best offer. Smith, 298-5868.

WASHER & DRYER, Maytag, 1-yr.-old washer, used 2 mos., 2-yr.-old dryer, used 1 yr., \$350; cream-colored couch, \$50. Mehlhaff, 286-1483, ask for Ken.

DELL COMPUTER, 450 Mhz, 128 MB, 17-in. monitor, DVD/CD, internal SCSI (SCSI Zip included), & IEEE 1394 FireWire, \$600. Matteucci, 304-7289.

ENCYCLOPEDIA BRITANNICA, 23 volume set, '62 edition, plus annual updates to '84, free to worthy home. Kesti, 821-9208.

MASSAGE TABLE & adjustable chair, custom crafts works, green & natural wood, used very little. Ginn, 286-4425.

FENDER DEVILL AMP, Ibanez & Applause GTX22 guitars, Boss Metal Zone & Zoom505 pedals, misc. items. Dubois, 884-1917.

PUPPIES, German shorthaired pointers, males, available 8/12/02, from proven hunters (upland, water) w/excellent temperaments, guaranteed, \$500. Prairie, 856-1156.

COLOR PRINTER, Hewlett Packard Deskjet 693C, 512 Kbyte built-in RAM, excellent condition, \$70 OBO. Anderson, 897-2772.

PLAYSTATION 2, new in shrink wrap, \$175 OBO. Carpenter, 228-3762.

WASHER ('94), \$150; Whirlpool electric dryer ('85), \$50; New York 3D jigsaw puzzle, \$30. Sieradzki, 292-5049.

CD CHANGER, Sony 200; underwater camera, fish tanks (2 x 30-gal., 10-gal.); hamster cage; 35mm camera & accessories; Kenmore carpet cleaner. Beggs, 323-5901.

BICYCLE CHILD CARRIERS, 2, \$10 ea.; single waterbed mattress/liner/heater, great condition, \$20. Smith, 828-3904.

GAS COOKTOP, KitchenAid, 30-in., black, \$75; Pfaltzgraff Heirloom dishes, service for 8, serving accessories, glassware, \$150. Blankenship, 856-0406.

WEIDER GYM, 2-station, full-body workout, includes lat pull-down, curls, bench & leg press, other accessories. Hannum, 296-2095.

MICROWAVE, Sharp, 1000W, clean, turntable, multiple functions, works great, \$50. Rule, 884-8762.

DINETTE SET: oak table, 36" x 60", 4 chrome/upholstered chairs, \$175; utility trailer, \$80. Thompson, 293-8390.

GLASS TABLE, oval, 4 chairs, \$100; entertainment center, fits 32-in. TV, never been used, \$100. Kaenshiro, 864-8982 or 440-8410.

SECURITY/SCREEN DOORS, two, 32-in., one, 36-in., \$20 ea. or \$50 for all. Kim, 255-0791.

DRESSER, 3 drawers, medium-dark stained wood, colonial style hardware, 40" x 17" x 31", \$75. Martin, 296-6727.

RECLINER, La-Z-Boy, rocker, blue, good condition, \$200. Young, 296-1138.

FURNITURE for student or cabin: sofa, \$40; two, '40's style rust chairs, \$40 ea.; antique chair, \$80; lamps, etc. Recharad, 292-1754.

TIRES & RIMS, low profile, 17-in. Enkei RS6, never been used, paid \$1,250, asking \$600. Gonzales, 379-0306.

BED LINER, Dodge Dakota Quad, came w/truck, new \$259, asking \$180. Forslund, 259-9072.

FULL-SIZE MATTRESS & BOXSPRING, Sleep-N-Aire, firm-O-Pedic, like new from guest room, \$75. VanDevender, 821-9435.

CHILD'S TWIN BED, w/wood headboard/footboard & mattress, in excellent condition, \$150. Greear, 294-5339.

HAM RADIO OPS: Duke City Hamfest, Aug. 23-24, equipment sales, forums, VE exams & more. Milesosky, 266-5901, www.qsl.net/dchf.

CD CHANGER, 12 disc, w/remote, good condition, \$125. Archuletta, 450-9058.

MATCHING RECLINERS, \$45 ea.; glass-top coffee/end tables, \$30 set; office desk, \$40. Redmond, 823-2109.

"MARES IN WAITING," original painting by Denton Lund, \$5,000. Graham, 332-0947.

OFFICE DESK, wood, 5-drawer, has scratches & chips, free to anyone willing to pick up. Bates, 839-5258.

RIDING LAWN MOWER, 19.5-hp., 42-in. Craftsman, used 4 times, front bumper, all manuals plus training video, \$1,050. Reuter, 884-8347.

EVAPORATIVE COOLER, Champion Model 4800, roof-mount downdraft, 1/2-hp motor, mounting legs, never used, \$250. Russell, 344-0290.

CAMPER SHELL, Brahma, for short-bed compact truck, blue, sliding window between shell & truck cab, \$225. Ashcraft, 281-9676.

DRESSER, w/mirror, white, \$90; computer desk, w/storage, \$30; microwave, \$30; new hanging luggage case, blue tweed, \$18. Harrison, 440-1919.

ALLOY WHEELS, 16-in. '95-'99 Cavalier Z24, tires worn, \$250 OBO. Martinez, 459-4451.

COUCH/DAY BED, has hidden 'pop-up' second single bed & mattress, cover included, \$125. Corwin, 298-0113.

MICRON COMPUTER, 166 Mhz, 80 MB RAM, 28.8K modem, keyboard, mouse, speakers, needs hard drive, \$50. Kettleborough, 293-4503, ask for Dan.

PFALTZGRAFF, new, 8 (3-pc. sets), brown, \$90; wood computer table, 22" x 32", \$50. Sandoval, 866-6991.

ROHN TOWER, 50-ft., \$150; Southbend 9-in. lathe, \$400; 2-hp vertical mill, \$700; homemade skid-steer ATV, \$300. Harrington, 296-8208.

BABY STUFF: oak crib/mattress, \$80; car seat, \$30; walker, \$10; stroller, \$10, all good condition. Cheng, 833-3282.

REFRIGERATOR, compressor works, needs fan; 7' x 10' storage shed, w/6-in. wooden floor, both free, you haul. Mozley, 884-3453.

DRAFTING TABLE, 84" x 44" x 1", refinished wood, top tilts/lays flat, rigid metal base, w/map drawer, \$100. Northrop, 884-4718.

YARD SALE, huge, 3-family, clothes, household, electronics, misc. 7/26 & 7/27, 2423 Wisconsin NE, Wyoming/Mensual. Langwell, 293-2728.

METAL LATHE & VERTICAL MILL, Enco milling/drilling machine. Bronkema, 281-9418.

USN RADIO CODE, set of instructional recordings, 78 rpm, free. Harris, 858-0667.

'82 MOTOR, Evinrude 140, complete, \$850 OBO. Lynn, 269-2019.

FEMALE DOBERMANS 1-yr.-old black/tan, tail & ears; 7-yr.-old blue docked & cropped, both spayed, Doberman rescue. Helfrich, 255-9580.

PATIO SET, 2 lounge chairs, 24-in. glass top table, \$80; Queens Jubilee Ty Beanie doll, \$75. Little, 883-9329.

TIMESHARE, 2 condo exchanges, both 1 wk, sleeps 4-6, use by 12/31/02, \$675 +handle exchange process. Kelly, 299-3527.

REGISTERED LABRADOR, blonde/yellow, 5-mo.-old female, needs good home w/room to roam, \$250. Schneider, 296-0868 or 994-3262.

POLE TREE TRIMMING SAWS, 2, \$10 ea. Hall, 298-8617.

REFRIGERATOR, Kenmore, 20 cu. ft., icemaker, white, \$225; upright frost-free freezer, Sears, 17 cu. ft., white, \$75, both good condition. Bentley, 856-7661.

CD CHANGER, Pioneer CDXFM677, 6-disc, brand new, works through your FM radio, paid \$229+, asking \$175. Rondelli, 890-5972.

FUTON MATTRESS, nearly new, \$300; operable VCR, \$25. Reed, 821-7782.

COLOR TV, 13-in., for home or RV, can demonstrate, \$60; stereo components: tuner amplifier, cassette player, Fisher speakers, \$30. Sherwin, 275-9134.

REFRIGERATOR, Amana, 24 cu. ft., almond, bottom freezer, new, \$350; White sewing machine, all stitches, \$35; carrying case, \$10. Burstein, 821-6688.

TRIVIAL PURSUIT GAMES, \$30; Zenith cassette stereo, \$30; car buffer, \$10; toaster/broiler, \$10. Kiro, 255-0890.

NINTENDO 64, 3 controllers, 2 rumble packs, 6 games, Tony Hawk 2, Super Smash Bros., \$160 OBO. Simon, 286-6492.

VACATION, 1-wk. timeshare, accommodates 6. Luther, 296-7402, ask for Fran.

VACATION, Cancun beach front, 5-star villa, 7 nights, sleeps 6, separate bedrooms for 2 families, \$1,200. Limon, 890-4135.

SOUTHWEST AIRLINE TICKET, transferable, expires, 4/2003, \$300. Polito, 856-6886.

BABY SWING, w/bassinet, \$15. Coverdale, 268-3040.

CANVAS CARPORT, Costco, 10 x 20, used once, \$100. Mirate, 268-3040.

SWING SET, w/slide, 2 swings, rocker, 2-seat basket, \$45; toddler bike set, w/mounting bracket, \$10; boy's 14-in. bike, w/helmet, \$20; 10-puzzle lot, \$5. Fong, 822-1367.

CAR-TOW DOLLY, MasterTow, w/all straps, drop ramps, lighted, 6-prong adapter, like new condition, \$750 OBO. Goodson, 286-1267.

How to submit classified ads

DEADLINE: Friday noon before week of publication unless changed by holiday. Submit by one of these methods:

- E-MAIL: Michelle Fleming (classads@sandia.gov)
- FAX: 844-0645
- MAIL: MS 0165 (Dept. 12640)
- DELIVER: Bldg. 811 Lobby
- INTERNAL WEB: On Internal Web homepage, click on News Center, then on Lab News frame, and then on the very top of Lab News homepage "Submit a Classified Ad." If you have questions, call Michelle at 844-4902. Because of space constraints, ads will be printed on a first-come basis.

Ad rules

1. Limit 18 words, including last name and home phone (We will edit longer ads).
2. Include organization and full name with the ad submission.
3. Submit the ad in writing. No phone-ins.
4. Type or print ad legibly; use accepted abbreviations.
5. **One ad per issue.**
6. We will not run the same ad more than twice.
7. No "for rent" ads except for employees on temporary assignment.
8. No commercial ads.
9. For active and retired Sandians and DOE employees.
10. Housing listed for sale is available without regard to race, creed, color, or national origin.
11. Work Wanted ads limited to student-aged children of employees.
12. **We reserve the right not to publish an ad.**

DINING SET, 6 chairs, \$350; china cabinet, \$650; china, 12 settings, \$300; kitchen set, \$125; sofa & love seat, \$125; end tables (2), \$50; lawn mower, \$300. Lauer, 296-2512.

SOCKET SET, 18-pc., new Proto, 1/2-in. drive, 3/8-in to 1 1/4-in. sockets, metal case, \$125. Barnard, 856-1952.

SPEAKERS, Manaplanar IIb, excellent condition, \$300. Hertel, 345-1088.

PATIO CHAIRS, 4 high-back, swivel/rocker, white w/dark green cushions, 42" x 26" x 17", \$30 ea.; 3 white tables, 20" x 20", \$20 ea. Thompson, 292-2877.

BROYHILL QUEEN BED, 4-post, headboard & footboard, \$295; Sealy queen-size mattress & spring, \$295 or both \$550. Polito, 298-3859.

TREATED POWER/LIGHT POLE, w/breaker box & breakers, good condition, 8" x 25", \$175 OBO. Gonzales, 823-2081.

MATCHING COUCH (8') & love seat (6'), beige, slight tear in cushion, \$125 OBO. Lujan, 822-0205.

TRANSPORTATION

'84 PONTIAC PARISIENNE, new transmission, 75K miles, second owner, would make great low rider, \$800 OBO. Barbera, 275-2562.

'98 DODGE RAM 1500, V6, AT, mag wheels, tilt, AC, AM/FM/cassette, bed liner, approx. 58,175 miles, bids accepted through Aug. 2, right to refuse bids, \$75 as is. Sandia Labs FCU, 237-7384.

'98 HONDA CIVIC, 4-dr., AT, PW, PL, AC, cruise control, excellent condition, \$5,700 OBO. Myers, 296-1093.

'93 MERCURY VILLAGER GS, PB, PS, AC, blue, new tires, 85K miles, excellent condition, \$5,480 firm. Evanoff, 821-0654.

'74 VOLKSWAGEN BUG, nice body, runs great, heater, AM/FM, new brakes & clutch, \$2,300 OBO. Baca, 304-8359.

'95 MERCEDES 280C, loaded, 94K miles, excellent condition, \$15,500 OBO. Carter, 573-2104.

'94 CHEVROLET BERRETA, 2-dr., V6, loaded, cloth interior, extra clean, 100K miles, \$3,600. Sturgeon, 281-9035.

'95 CHEVY ASTRO VAN, V6, AC, PW, PL, great condition inside & out, below book, \$6,450 OBO. Giere, 792-4960.

'88 TOYOTA 4-RUNNER, 146K miles, original owner, runs great, lots of miles left, \$4,250. Morrison, 239-3622.

'92 CHEVY 3/4-TON, 4x4, regular cab, 5.0L, 5-spnd., custom shell, good condition, \$4,200. Miller, 296-2697, ask for Phil or Mark.

'85 LINCOLN TOWN CAR, white, blue leather, good condition, most everything works, 109K miles, \$1,500 OBO. Armstrong, 271-8302.

'78 FAIRMONT, red/white vinyl, original upholstery, 1 owner, 32K miles, best offer over blue book. Schulz, 856-9227.

'96 DODGE DAKOTA, 4x4, extended cab, 2-dr., AC, 5-spnd., fiberglass top, 57K miles, \$9,000. Heffelfinger, 281-1733.

'92 NISSAN 240SX, fastback, 2.4L, AT, PS, PB, original owner, nice sporty driver. Edgar, 620-5137.

'95 TOYOTA PICKUP, X-cab, V6, 4x4, AT, blue, 92K miles, new tires, great condition, \$9,600 OBO. Trujillo, 203-9150 or 899-0349.

'98 CHRYSLER SEBRING LXI, loaded, leather, sunroof, CD, new tires, 75K miles, excellent condition, \$10,500. Sanchez, 352-0905.

'00 FORD EXPEDITION, Eddie Bauer, 4WD, fully loaded, 1 owner, excellent condition, 40K miles, \$26,000. Marin, 869-1212.

'99 JEEP GRAND CHEROKEE LAREDO, 6-cyl., 4-dr., 4WD, loaded, leather seats, great condition, 27K miles. Schmitt, 856-1280.

'93 DODGE CONVERSION VAN B250, 318-V8, white/ext., maroon/int., TV/VCR, 67K miles, excellent tires, excellent condition, \$8,300 OBO. Serna, 899-9618.

'88 SUZUKI SAMURAI, 4x4, 5-spnd., new tires, top, carpet, door panels, tow ready, 104K miles, \$2,900 OBO. Thomas, 294-2960.

'87 TOYOTA PICKUP, 4x4, ext. cab, 4-cyl., fuel injection Turbo, AC, CD, camper shell, new tires, 167K miles, runs well, \$3,200 OBO. Garcia, 244-3247.

'97 SUBARU LEGACY L, 4-dr., tinted windows, AWD, AC, burgundy, 63K miles, great condition, \$12,000 OBO. Carmignani, 839-4203.

'87 MUSTANG HARTOP, 298-V8, AT, PS, AC, new paint, upholstery, carpet, \$7,900 firm. Ellis, 275-1609.

'98 FORD EXPEDITION, 4.6L V8, 4WD, XLT, front/rear AC, 3rd seat, alloy wheels, ABS, 59K miles, excellent condition, \$16,950 OBO. Sterk, 856-7784.

'65 MERCEDES 220SB, show car w/trailer, \$5,000 OBO. Manley, 281-5298.

'99 Z-28 CAMARO, loaded, T-top, ground effects, all options w/warranty, 31K miles, new tires, excellent condition, \$18,500. Baum, 797-2491.

'97 DODGE RAM, 4x4, V8, driftwood, CD, keyless entry, bed liner, very clean, below NADA of \$16,300, asking, \$14,000 OBO. Montoya, 890-7980.

'95 EAGLE VISION ESI, power everything, AM/FM/CD/cassette, climate control, 27 mpg, 145K miles, excellent condition, \$4,500. Kercheval, 266-5833.

'93 ISUZU TROOPER, 4-dr., 4WD, AC, dark blue, super clean, maintenance records, great shape, 176K miles, \$4,300 OBO. Ellington, 797-9694.

'95 OLDS ACHIEVA, 2-dr., Quad-4 engine, AC, loaded, under 50K miles, excellent condition, \$5,200 OBO. Vance, 573-4114.

'91 FORD TEMPO, neat & clean, perfect student car, new exhaust system, radiator etc., \$1,250. Hey, 898-6679.

'87 JEEP COMANCHE, 4x4, 4.0L, 6-cyl., 5-spnd., AC, CD, new paint, tint, tires, \$3,795 OBO. Montana, 363-2906.

'95 JEEP GRAND CHEROKEE, 4x4, 6-disc changer, new tires/brakes, 140K miles (mostly highway), great condition, \$7,000 OBO. King, 620-5139.

'89 NISSAN STANZA, 5-spnd., AC, very clean, 170 K miles, excellent condition, \$1,750. Cox, 299-5212.

'94 FORD F-150 XLT, step-side, 4WD, V8, AT, bed liner, towing package, alloy wheels, low mileage, \$11,900 OBO. DeSantis, 821-2115 or 269-2852.

'95 TOYOTA TACOMA, Xtra cab, V6, 4x4, AT, deluxe shell, mint condition, 78K miles, \$13,000 OBO. Koehler, 710-0590.

'84 FORD RANGER, long bed, V6, AT, AC, tilt wheel, shell, hitch, AM/FM/cassette, recent tune-up, excellent condition, 82K miles, \$2,500. Hatch, 271-4697.

'94 FORD EXPLORER, loaded, 1 owner, very low mileage, 51K miles, excellent condition inside & out, \$8,000. Bisbee, 293-0356.

'97 SUZUKI SIDEKICK, 4WD, 4-dr., AC, AM/FM/cassette, hard top, good condition, 72K miles, \$6,000. Leigh, 237-2273.

'90 ACURA LEGEND, V6, AT, AC, PL, PW, power sunroof, leather interior, 170K miles, \$3,000 OBO. Sanchez, 730-6009.

WANTED

AKC JACK RUSSELL TERRIER, stud for AKC female Jack, pick of litter for stud fee. Sena, 315-0443.

ALLOY WHEELS, original 15" x 7", off Ford 1/2-ton pickup. Gutierrez, 239-7059.

CHEAP CAR, or truck for a teenager, will pay cash. Lenberg, 238-0362.

GOOD HOME, 2 dogs, very friendly, 3-yr.-old rottweiler-cross dogs, w/all their shots. Mitchell, 797-0413.

GOOD HOME, 2 female, medium-sized mixed-breed puppies, we rescued, but cannot help. Sifford, 869-3982.

REFRIGERATOR, washer/dryer, lawn mower, & other various items in good working condition, first time home owner. Jenkin, 299-9309.

TUTOR, reading & math for 2nd grader & high school freshman. Ramirez, 332-2508.

CAMPER SHELL, black, for '95 Chevy S10, short bed; for sale: almost 2-yr.-old male bearded dragon, \$75. McCrory, 401-4412.

BOX TURTLE, to establish breeding population in outdoor habitat, healthy female of yellow (solid brown) subspecies. Ashby, 281-1573.

GOOD HOME, gray kitten, 5 wks. old, blue eyes, female, cute, healthy, needs love. McFadden, 866-5140.

GOOD HOME, 2 adult cats, owner allergic, great companion animals. Eckstein, 294-3273.

GOOD HOME, adorable Chihuahua-mix puppy, female, 15-wks. old, brown & black, totally lovable. Burton, 291-6094.

SWIMMING COACH, for Kirtland Aquatic Swim Club, Red Cross First Aid/USA certified. Chavez, 877-7518, www.geocities.com/kacswin.

RECREATIONAL

'99 TAHOE 5TH WHEEL, 25-ft., fully loaded, beautiful, used 3 times, must sell, \$17,000 OBO. Gabaldon, 268-0088.

'76 CLASS A ARGOSY, runs great, \$4,200 OBO; 90-hp Johnson outboard. \$1,000 OBO. Vickers, 291-1333.

'99 ALLEGRO MOTORHOME, 33-ft. WB-HWH leveling, 6.8 Onan, slideout, loaded, 15.5K miles, excellent condition, \$55,800. Barnes, 294-8968.

'86 JAYCO 806, deluxe pop-up trailer, 8-ft., sleeps 6, furnace, awning, battery, great condition, \$1,700. Whiston, 292-1541.

'86 HONDA SHADOW 500, windshield, cover, saddle bags, well maintained, 26K miles, \$1,400 OBO. Graf, 922-8736.

'94 COACH HOUSE, Class B motorhome, fully self-contained, roof air, awning, 37K miles. Evans, 281-3864.

BICYCLE, 10-spnd., Husky, ridden around the block twice, \$65. Beller, 881-4047.

'91 KAWASAKI 250HS, Ninja 250cc powered cruiser, saddle bags, perfect commuter, 60-mpg, much nicer than Honda Rebel, \$1,100. Jacobs, 301-6440.

KAYAK, w/skirt, bladders, life vest, & paddle, \$150. Parish, 883-4879.

SAILBOAT, 15-ft. West Wight Potter, cuddy cabin, 4-hp. Mariner outboard motor, \$3,250; wanted: canoe, good condition. Jones, 797-4894.

KAYAK-SEYFLOR, 2 person, inflatable, w/paddle, never used, \$150; volleyball net w/ball, brand new, \$50. Burgin, 299-6730.

'92 HONDA CBR600, custom paint & extra parts, \$3,000 OBO. Strauch, 259-3423.

'96 SUZUKI BANDIT, 600cc, red, slight body damage, 9K miles, \$3,400 OBO. Hibbard, 797-7279, ask for Patrick.

'99 CMC, custom cruiser, black, S&S Motor, all chrome, basically new, 3.2K miles, \$18,000. Cenicola, 994-2132.

'01 SUZUKI SV650S, sharp royal blue, like new, includes 3 yrs. free maintenance, 3.5K miles, \$4,495; Shoei Fr900 helmet w/smoke visor, \$200; motorcycle jacket, \$150. Santillanes, 332-0996.

REAL ESTATE

4-BDR. HOME, furnished, 1/2-acre, WD, storage, garden, going on temporary assignment, \$1,600/mo. Fronczak, 344-7069.

3-BDR. HOME, 2-1/2 baths, custom home in Four Hills, w/skylights, fireplace, 11-ft. ceilings, tons of extras, \$210,000 OBO. Elevario, 323-0448.

3-BDR. MOBILE HOME, carport, 2 baths, 3/4-acre, deck, storage sheds, landscaping, fruit trees, well water, country living, Los Lunas. Valles, 865-5029.

4-BDR. HOME, 2-1/2 baths, 2,680 sq. ft., study, pool, by Netherwood Park/ golf course, \$259,000. Chapman, 271-9686.

2-BDR. HOME, Nob Hill, 1,550 sq. ft., garage, den, tile/oak floors, deck, fenced, sheds, \$149,000. Mignardot, 254-9092.

3-BDR. HOME, lovely Ridgecrest area, near base, 2,000+ sq. ft., hardwood floors, deck/jacuzzi, workshop, \$225,000. Henderson, 254-1803.

3-BDR. HOME, 2 baths, beautiful, mountain, 1.3 acres, Tabazon, 20 min. from KAFB, redwood deck, 2-car garage w/work-space & storage, \$250,000. Lewis, 286-2393.

3-BDR. MOBILE HOME, 2 baths, double-wide, carport, 2 covered decks, gas log fireplace & more, Oak Creek. Miller, 831-4541.

WANTED

AKC JACK RUSSELL TERRIER, stud for AKC female Jack, pick of litter for stud fee. Sena, 315-0443.

ALLOY WHEELS, original 15" x 7", off Ford 1/2-ton pickup. Gutierrez, 239-7059.

CHEAP CAR, or truck for a teenager, will pay cash. Lenberg, 238-0362.

GOOD HOME, 2 dogs, very friendly, 3-yr.-old rottweiler-cross dogs, w/all their shots. Mitchell, 797-0413.

GOOD HOME, 2 female, medium-sized mixed-breed puppies, we rescued, but cannot help. Sifford, 869-3982.

REFRIGERATOR, washer/dryer, lawn mower, & other various items in good working condition, first time home owner. Jenkin, 299-9309.

TUTOR, reading & math for 2nd grader & high school freshman. Ramirez, 332-2508.

CAMPER SHELL, black, for '95 Chevy S10, short bed; for sale: almost 2-yr.-old male bearded dragon, \$75. McCrory, 401-4412.

BOX TURTLE, to establish breeding population in outdoor habitat, healthy female of yellow (solid brown) subspecies. Ashby, 281-1573.

GOOD HOME, gray kitten, 5 wks. old, blue eyes, female, cute, healthy, needs love. McFadden, 866-5140.

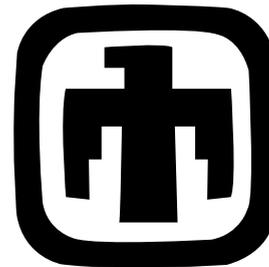
GOOD HOME, 2 adult cats, owner allergic, great companion animals. Eckstein, 294-3273.

GOOD HOME, adorable Chihuahua-mix puppy, female, 15-wks. old, brown & black, totally lovable. Burton, 291-6094.

SWIMMING COACH, for Kirtland Aquatic Swim Club, Red Cross First Aid/USA certified. Chavez, 877-7518, www.geocities.com/kacswin.

LOST & FOUND

FOUND: pair of prescription glasses in gray case outside Bldg. 868 on July 10th. Young, 284-6891.



President Bush tours labs' exhibits, praises scientists serving in front lines of war against terrorism

During visit to Argonne National Lab, president says nation will fight terror on 'frontiers of knowledge'

President George W. Bush toured exhibits on the national labs' counterterrorism activities Monday, including two from Sandia, and then spoke about his admiration and support for scientists' efforts on behalf of the nation's war against terrorism.

Bush spoke at Argonne National Laboratory, near Chicago, where a series of exhibits by national labs, including Sandia and Los Alamos, had been set up over the weekend.

Bush said the American people are "in a new kind of war today. We face a ruthless and resourceful enemy," people who hate freedom, who seek to "acquire the most destructive of weapons," and intend "to spread fear and death around the world."

"To prevail in this war, we will fight on the frontiers of knowledge and discovery," the president said.

"In this new war," said Bush, "we will rely upon the genius and creativity of the American people. And that's why I'm here, to look in the eyes of those who possess the genius and the creativity of the American people."

"Our scientific community is serving on the front lines of this war, by developing new technologies that will make America safer. And as you tackle new scientific challenges, I want you to know our government will stand by your side to make your job easier."

"I've just come back from viewing some demonstrations of the great work done at national laboratories, whether it be here, or Los Alamos, or Sandia, or others. The American people need to know we've got a lot of brain power working on ways to deal with the threats that we now face as we head into the 21st century."

"For example, I saw a warning and response system that will supply first responders with timely and life-saving information in the event of a chemical attack on a subway or any other enclosed space. I saw a project that uses new advances in genetic research to identify and understand biological agents that could be used against us. I saw computer simulations to help policy makers and first responders anticipate the effect of an attack of nat-



BY SPECIAL REQUEST — Sandia researcher Mark Tucker (6245, holding nozzle) demonstrates Labs-developed decontamination foam to President George W. Bush (center). Other members of the high-powered delegation to view various DOE labs' antiterrorism projects at a quickly organized event Monday at Argonne National Laboratory near Chicago included, from left, Ray Orbach, director of DOE's Office of Science, DOE Secretary Spencer Abraham, and US House Speaker Dennis Hastert, R-Ill. (on the other side of Bush). (Photo by George Joch, Argonne National Laboratory)

ural disaster, and to develop life saving plans.

"What I saw was new technologies that our scientists are developing to help us secure the homeland. America is grateful — it's grateful for your work."

Five technology exhibits from the national labs had been quickly shipped to Argonne and set up for Bush. They included Sandia's decontamination foam, used to rid Capitol Hill buildings of anthrax and also to help decontaminate ABC and NBC news buildings in New York. Sandia's Mark Tucker (6245) demonstrated that to the president. The

National Infrastructure Simulation and Analysis Center (NISAC), a joint Los Alamos National Laboratory/Sandia project was another. Sandia's Steve Rinaldi (6518) was there demonstrating that project to Bush.

The other technology demonstrations shown to the president were the Biological Aerosol Sentry Information System, a joint LANL and Lawrence Livermore National Laboratory project; DNA Analysis of Pathogens, also a joint LANL and LLNL project; and the Nuclear Emergency Search Team (NEST), consisting of people from DOE and all three of the NNSA labs.

Mike Clough and Mike Lanigan (both 12640) helped coordinate and set up the Sandia exhibits.

'Red Menace' football fanatics fire up north end zone of University Stadium

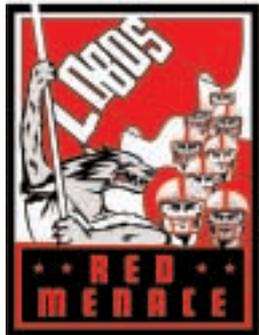
The Red Menace (TRM), a group of hardcore University of New Mexico (UNM) football fans — many of whom work at Sandia — want to fill up the new north end zone of University Stadium every home game this fall.

The group has the goal of Sandians and others buying 1,000 season tickets at the discounted price of \$35 each. Many of the tickets will be given to disadvantaged youths and Young American Football League (YAFL) football players. Other seats will be occupied by Sandians and their families cheering the Lobos on to victory.

Last year TRM bought 365 season tickets in the north zone, which opened with the first home football game. This year they hope to triple that amount.

"The north zone of the stadium is ours," says Fred Romo (10257), one of the founding members of TRM. "It's a section where we can stand and yell the entire game without being told to sit down. Anyone who sits in this section has to be prepared to stand and cheer for the entire game because that is what TRM is all about."

TRM kicked off last year, encouraging Sandians



to buy season tickets at the discounted rate of \$50. Then the group came up with the idea of leveraging their buying power and approached UNM with the suggestion of an even better discount of \$35 for each north end zone season ticket purchased through TRM.

"UNM not only went for our proposal, they extended it through this season as well," Fred says.

The discount is available through Aug. 12. After that, ticket prices for the north zone will be \$50 — still a bargain, Fred notes.

Andy Mara (6200), another member of TRM, believes that the group is "energizing both the team and the rest of the stadium."

"The Red Menace has even started its own tradition with the Lobo Leap whereby a Lobo football player leaps into the north end zone stands whenever they score a touchdown," Andy says.

Besides having fun, TRM wants to give a good time to local YAFL teams and disadvantaged kids who might not otherwise have the opportunity to attend a college football game. The group is currently conducting a drive to buy at least 100 such season tickets, which will provide attendance to 600 youths at one per game. (There are six home games this season.)

More information about TRM and how to obtain UNM football tickets can be found at <http://www.theredmenace.com>. People can contact Andy Mara directly at 844-1099, if they are interested in donating tickets for disadvantaged youths.

— Chris Burroughs

Feedback

No new Bldg. 821/823 entrances in the cards . . . for now

Q: As a safety issue, why isn't there an entrance from the Bldgs. 821/823 parking lots south of N Avenue onto Hardin, and from Hardin into those parking lots? It would reduce the amount of vehicular traffic on N Avenue, thus the chance for collisions with pedestrians. Even if the entrance and exit were only onto the westbound lane of Hardin (to avoid introducing another stoplight), it would provide some relief.

B: Installing an exit onto Hardin from the 821/823 parking lot would create a traffic hazard and interfere with current storm drains. There is not sufficient distance from the intersection of 9th and Hardin or from 14th and Hardin to meet traffic design and safety criteria. Sandia follows City of Albuquerque design guidelines for traffic design and control. In the near future the Storm-sewer, Sanitary-sewer, and Water Modernization project (SSWM) will eliminate the open ditch at the south side of the 821/823 parking lots. At that time we will reevaluate the possibility of changing the configuration of the parking lot that may allow for different entrance and exit scheme.

— Ed Williams (7849)