TINA NENOFF (1133) observes an experiment to create superalloy nanoparticles in a testing cell at the Gamma Irradiation Facility. (Photo by Randy Montoya)

More than the sum of its parts

Nanoparticles unlock the future of superalloy metals

By Darrick Hurst

A team of Sandia researchers is pioneering the future of superalloy materials by advancing the science behind how those superalloys are made.

As part of Sandia's nanoscale research, a group of experts specializing in inorganic synthesis and characterization, modeling, and radiation science have designed a radical system of experiments to study the science of creating metal and alloy nanoparticles.

This research has vast implications, says Tina Nenoff (1133). The lightweight, corrosion-resistant materials that the team is creating are needed for weapons casings, gas turbine engines, satellites, aircraft, and power plants.

> *"What we're doing is taking a completely new approach to thinking about producing superalloy materials."*
>
> **Sandia researcher Tina Nenoff**

"What we're doing is taking a completely new approach to thinking about producing superalloy materials," Tina says. "We're using radiation to break down the molecular structure of substances and form nanoparticles — a synthetic approach that is flexible and versatile for making large quantities of superalloy nanoparticle compositions that can't be easily created otherwise."

The science of alloys

A quick trip down memory lane to the days of high school science class will recall those chapters on material and chemical science defining alloys as a combination of two or more elements, at least one of which is a metal, where the resulting material has metallic properties different — sometimes significantly different — from the properties of its components. For instance, steel is stronger than iron, its primary component.

The Superman of alloys

Superalloys, as the name would imply, stand out from the general population of alloys in the same way Superman would be considered extraordinary compared to the rest of us. These specialized alloys are exceptionally strong, lightweight, and able to withstand extremes that would destroy everyday metals like steel and aluminum.

"These high-performance superalloys are revered for their remarkable mechanical strength, and their resistance to corrosion, oxidation, and deformation at high temperatures," says Jason Jones (1133).

In the past, the development of these superalloys has depended on chemical and technological innovations, and been driven mainly by the aerospace and power industries where superalloys are in high demand.

"The method of radiation we're studying — known as radiolysis — introduces an entirely new area of research into creating alloys and superalloys through nanoparticle synthesis," Tina says. "This process holds promise as a universal method of nanoparticle formation. By developing our understanding of the basic material science

(Continued on page 4)

Sandia LabNews

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Sandia National Laboratories

Directed-energy defense weapon tested at Sandia explosives facilities

Tests of Raytheon laser-based system show potential of technology

By Stephanie Holinka

To enhance protection of military assets from mortar and small rocket attacks, Sandia, the Air Force Research Laboratory, and Raytheon Missile Systems Group successfully tested a prototype solid-state laser defense weapon built on the already-existing US Navy Phalanx platform.

The Phalanx close-in weapon system (CIWS - pronounced "sea-whiz") is a fast-reaction Gatling gun deployed on Navy ships to protect against anti-ship missiles.

In the tests, the Laser Area Defense System (LADS) replaced the Gatling gun on the Phalanx with an off-the-shelf invisible-beam laser capable of destroying incoming targets. The tests were designed to determine if the weapon — based on a commercially available fiber-based laser system — could rapidly destroy mortar threats. The tests represented a major step in deploying a laser-based system to fill critical defensive military and homeland security needs, researchers say.

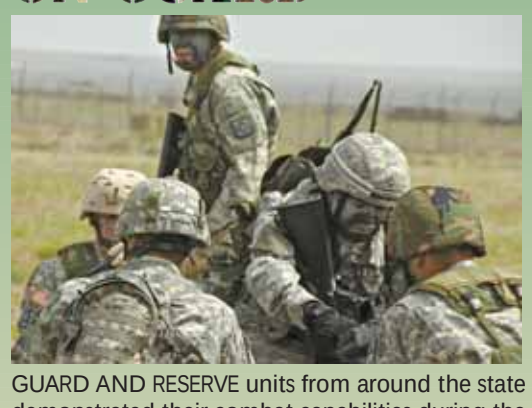
"Our simulation predicted that industrial fiber lasers with moderate power capabilities, simplified beam control, and limited beam quality could provide an initial near-term solution to the problem," says Frank Brueckner, Raytheon program manager, "However conventional wisdom held that more power and a nearly perfect beam would be needed. These tests proved we are on

(Continued on page 5)

Also inside . . .

- Sandia hosts conference to rewrite DOE Explosives Safety Manual . . . . . **Page 3**
- Nuclear Weapons SMU restructures . . . . . **Page 4**
- Small businesses turn to Sandia for innovative solutions to technical problems . . . . . **Page 8**
- Tonopah Test Range Family Day . . . . . **Page 10**

ON GUARD



GUARD AND RESERVE units from around the state demonstrated their combat capabilities during the annual Bosslift exercise for New Mexico business and community leaders. Sandia went along for the ride. Story and photos on **pages 6-7.**

16-year-old Wisconsin student snags Sandia science fair scholarship

Nano project also best in show

By Jacqueline Cieslak

Sandia judges looked at Philip Vidal Streich's Intel International Science and Engineering Fair (ISEF) project and liked what they saw. On the basis of their judgment, Sandia awarded Streich, a homeschooled 16-year-old from Platteville, Wis., a $2,500 scholarship for his project, "Determining Carbon Nanotubes' Thermodynamic Solubility: The Missing Link to a

(Continued on page 5)

Dick Fate's most courageous hike

After an increasingly frustrating and futile series of surgeries over the years to fight a rare form of cancer, Dick Fate goes under the knife one last time to find recovery, life . . . and the means to complete a momentous walk with a very important person. Read Dick's story by Iris Aboytes on **page 12.**

Darrick Hurst wins music awards

A wisdom beyond his years about what's really important in music and in life serves student intern Darrick Hurst well at the New Mexico Music Awards. Darrick's band, Man Born Blind, won best alternative rock song and Darrick won for best album design. Read Neal Singer's story about Darrick on **page 9.**

What's what

There was a little reminiscing here several weeks ago about "soundies," short films of musical performances that were sort of protovideos. It was prompted by a KNME-TV show hosted by singer Michael Feinstein, who has collected thousands of soundies and is a leading authority on their origin, equipment that showed them, etc.

That show noted that they were produced "between 1940 and 1946," and those dates were passed along in the piece about the show. But retiree Johanna James remembers them a bit earlier:

"I can remember as a child being taken to a bar by my parents and seeing the 'soundies juke box.' Inside was a rear screen Ampro 16mm projector with a continuous reel. This was in the late 1930s, perhaps 1937. As a side note, kids were served a small A&W-type mug with beer. Just like the parents. Times sure change! This was in Denver."

* * *

HOWARD KERCHEVAL

Older-timers tell me the search for close-by restaurants with good, inexpensive food has been a quest of Sandians for far more than the nearly 16 years I've been here. And the urgency increased appreciably when the Coronado Club was closed, cutting off that option for pretty good food at pretty good prices. (For newcomers who never had the chance to sit under the trees and have lunch next to the swimming pool on a balmy summer day, or dash in quickly on a cold winter day, the green chile stew was legendary.)

There's the cafeteria, of course, which has been there all along, and within a quick trip off the base, there's Bea's #2, Griff's, Roper's, a couple of Lotaburgers, Powdrell's, Chili's, Golden Pride, and a new Golden Corral, among others. And Jim Clinch (9105) emails from the Sandia Science and Technology Park that two more are on the way: a Church's Chicken in the southwest quadrant of the Central-Eubank intersection, expected to open in early July, and a Starbuck's south of Walgreen's on Eubank, expected to open in September.

A well-known axiom has it that an army marches on its stomach. So, it seems, does a laboratory.

* * *

Careful what you do with those old, seldom-used wedding gifts.

A colleague recalled recently that an elderly next door neighbor was ailing some time back, and that he and his wife decided to take her some flowers. They put the flowers in one of a matched pair of wedding-gift vases and delivered them.

Some time went by and they realized that the vase had never been returned. They debated what to do, conceding that to go over and ask for the vase back would mortify the by-now-even-more-elderly neighbor. More time went by and the inevitable happened, and after yet more time went by, there was an estate sale.

They went. They saw. They bought. And the long-missing vase is now back with its mate.

* * *

Still no word from Suavé Superfly.

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

Sandia LabNews

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LOCKHEED MARTIN

Sympathy

To Janet Von Toussaint (8521), on the death of her husband Dave, who passed away April 7 in Livermore, Calif.

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Security Salutes
Safeguards and Security Recognition Program

Security Salutes honors Manuel Barreras

Security Salutes, the program created to recognize and reward exemplary security practices, has named Manuel Barreras (10842) as its latest honoree.

MANUEL BARRERAS

According to the Security Salutes citation, "Manuel goes the extra mile when it comes to protecting the keys to our work (i.e., our badges). He has demonstrated this on a regular basis by constantly reminding folks who display their badges outside of Sandia to put their badges away."

In addition to honoring Manuel, Security Salutes also recognized the attendees of the March Office of Independent Oversight (OIO) security information session. Attendees were honored for embodying Sandia's commitment to achieving operational excellence through improved security performance. The OIO session focused on DOE reporting requirements and management of Official Use Only (OUO) information. During the session, attendees were given some basic tips on how to survive and benefit from an inspection (e.g., simple dos and don'ts).

The Security Education and Awareness Liaison (SEAL) team, which determines the Security Salutes honorees, expressed its appreciation for "the initiative demonstrated by Manuel and the individuals who attended the OIO information session. SEAL challenges all members of the workforce to continue to be proactive with regard to Security."

Security Salutes encompasses all Sandians, including personnel at Sandia/California, remote sites, and cross-cutting programs.

Since its inception, the Security Salutes program has recognized 60 individuals for their support of security practices. Examples of the positive actions have included:

• Displaying courage and tactfulness by approaching a person who was using a personally owned cell phone inside a limited area and escorting the individual to a Protective Force officer.

• Recognizing and reporting improper storage of unclassified controlled information.

• Suggesting and assisting with implementation of an improved security process associated with the current OIO inspection.

If you know someone (employee, contractor, consultant) who has exhibited a good security practice, consider nominating that individual for recognition by the Security Salutes Program.

For more information, visit the Security Salutes website on the internal web at: www-irn.sandia.gov/security/resource/salutes.

Feedback

Q: *Does Sandia specifically allow or disallow employees to host high school foreign-national students through a foreign-exchange program in their homes? Does the sensitive/nonsensitive classification of the student's nationality make a difference? What is the policy?*

A: Sandia not only allows but also encourages employees to consider hosting a high school foreign-exchange student. It is an enriching experience for everybody. Obviously, the Sandian needs to avoid discussing or otherwise revealing classified or sensitive information. Moreover, if the student is from a "sensitive" foreign country, then the Sandia host needs to report this to Counterintelligence as a "substantive" personal contact. This reporting is very easy to do; either visit the Office of Counterintelligence website at www-irn.sandia.gov/srn-ci or call our hotline at 284-4760 or 844-3834 and we will be happy to help.

— Bruce Held (301)

Controlled chaos, or going BOOM! safely

Sandia/California hosts 56th annual DOE Explosives Safety Committee meeting

By Patti Koning

Explosives are part and parcel of much of the work conducted at Sandia and across the entire DOE complex. Computer modeling can only take you so far — that's why large areas of the Sandia/New Mexico site are dedicated to explosives testing and places like Site 300 and the Nevada Test Site exist.

Working with explosives carries an inherent danger. Ensuring that work is carried out safely is the mission of the DOE Explosives Safety Committee (ESC). Representatives from Sandia, Lawrence Livermore, Los Alamos, Pantex, the NNSA Office of Military Application and Stockpile Support, and other DOE sites make up the ESC.

Last month, the ESC held its 56th annual meeting at Sandia/California.

"This was a very positive, very productive meeting," says Herman Armijo (8517), who hosted the event. "We had a resolution of an outstanding finding, a great accomplishment."

The meeting had one main purpose — to update the DOE Explosives Safety Manual, which is the bible of explosives work. Any such operations must follow the manual to the letter. The manual is carefully worded, with requirements differentiated by "shall" (mandatory) and "should" (advisory).

The 200-plus-page manual covers a wide range of topics, such as criteria for guns used to fire projectiles at explosives targets, handling a misfire of a remotely fired gun, destruction of explosives by detonation, quantity-distance and level-of-protection criteria, and protecting explosives during an electrical storm.

The manual captures the expertise of the ESC. Members have more than 300 years of combined experience in explosives, fire safety, and security. In addition to Herman, Roger Smith and Tina Stetson (both 10322) are longstanding members.

SAFETY PROCEDURES for explosive tests like the one pictured here at Sandia from 2006 are addressed in the DOE Explosives Safety Manual, now entering its 10th edition.

Many, including Allan Herrbach of DOE, Jim Dotts from LLNL, and Roger had full military careers before their current positions.

Since 1978, the committee has updated the manual twice a year, which barely keeps up with changes in the field. Updating the manual is a painstaking process, involving line-by-line review by the entire committee.

"The manual is a living document and as such, continues to change," says Dotts "Technology changes, the way we conduct work changes, and we are constantly learning on the job."

A new version of the manual comes out after it goes through RevCom, the official DOE review process that allows outside input. To get an idea of how long RevCom can take, the eighth revision was released in 1996; the ninth revision finally completed RevCom in 2006. Later this year the 10th revision will be submitted for a "mini" RevCom, which will take input from interested parties only,

Between RevCom updates, Dotts and John Taylor of Pantex release a committee version to get the updates into the hands of those working with explosives in the field.

The 56th Annual Meeting also marked Herrbach's retirement along with that of C.V. Vick of Lawrence Livermore.

"Allan has been a valuable contributor and I'm not sure who will fill his shoes," says Herman. "He helped us meet the requirements and stay safe."

To read the manual, go to: www.directives.doe.gov/pdfs/doe/doetext/neword/440/m4401-1a.pdf.

Sandia CaliforniaNews

Sandia funds Science Teacher of the Year award

By Patti Koning

Next year one or more teachers in the Livermore Valley Joint Unified School District will receive the Sandia Science Teacher of the Year award. Honorees will receive a grant of approximately $500 for use in their classrooms. (The exact amount of the award is based on available funds in a given year.)

The award is made possible through a new permanent endowment recently established by Sandia/California on behalf of the Livermore Valley Education Foundation (LVEF), a nonprofit organization that supports Livermore schools.

"Recognizing and rewarding a teacher, or teachers, of the year is very important, not just to Sandia, but to the entire community," says Community Relations Officer Jim Simmons (8528). "We're very proud to support science education in this way."

LIVERMORE VALLEY EDUCATION FOUNDATION President Victoria Schellenberger talks with Jeff Manchester and Jim Simmons (both 8528) and Art Pontau (8750) at a recent community event. (Photo by Randy Wong)

A $40,000 Lockheed Martin grant

Sandia established the endowment with $40,000 from Lockheed Martin's gifts and grants program. While the principal will remain untouched, the annual earnings will be used to make the annual cash award. LVEF President Victoria Schellenberger expects the endowment to generate $800 or more annually.

She says she hopes other local businesses will follow Sandia's example and contribute to the endowment, thus increasing the amount available for awards.

"We're excited about this endowment because it means we can provide this award year after year," Schellenberger says. "It's really nice to reward our teachers for good work."

The program is modeled after Sandia/New Mexico's Excellence in Science Teaching awards (ESTe awards), which recognize top science teachers in elementary, middle, and high schools throughout Albuquerque public schools. Up to 10 teachers are chosen for the annual award and receive a $500 award.

The details of the award, such as the nomination and selection criteria, are still being worked out. One thing is for sure — LVEF will be handing one or more outstanding teachers a grant check next spring.

Superalloy

(Continued from page 1)

behind these nanoparticle formations, we'll then be able to expand our research into other aspects of superalloys, like nickel-based alloys."

The team is focusing its research on studying the science that happens in the "novel metastable phase spaces" that are not accessible with traditional alloy production methods, such as melting, says Tina. These "phase spaces" are possible points in a given path, or orbit, that represent the motion of a particle over a period of time. Each potential state of that particle's system corresponds to one unique point in a phase space. Understanding these spaces is important for determining what alloys are created, and how they form.

"This process holds promise as a universal method of nanoparticle formation."

In the team's experiments, solvent molecules are combined with molecules or ions and dissolved in water, and the researchers then subject the solution to radiolysis. By varying the reaction conditions and using alcohols as agents to limit particle growth size, the researchers say they have determined through high-resolution transmission electron microscopy that they have been able to successfully grow particles that are nearly identical, delivering essentially defect-free superalloy metal nanoparticles.

Specialized in-house facilities

The team of Sandia researchers perform these highly specialized experiments with the unique combination of the in-house Gamma Irradiation Facility (GIF) and the Ion Beam Materials Research Laboratory (IBMRL), which provide the radiation environments demanded by this research.

Tina Nenoff's superalloy research team includes Kevin Leung (1133), Don Berry (1382), Jim Knapp (1111), Paula Provencio (1111), Dana Powers (6770), Jason Jones (1133), and project manager Carlos Gutierrez (1133).

"The target solutions are placed in the testing cells at the GIF where they are exposed to a variety of gamma irradiation test configurations and controlled radiation dose rates," says Don Berry (1382), GIF supervisor. "High-intensity radioactive sources, which are kept submerged below 18 feet of deionized water to shield workers from radiation, are then raised via elevators into the testing cells to irradiate the targets. Once the irradiation is completed, the radioactive sources are returned to their shielded location in the water pool, and workers can again safely enter the cells."

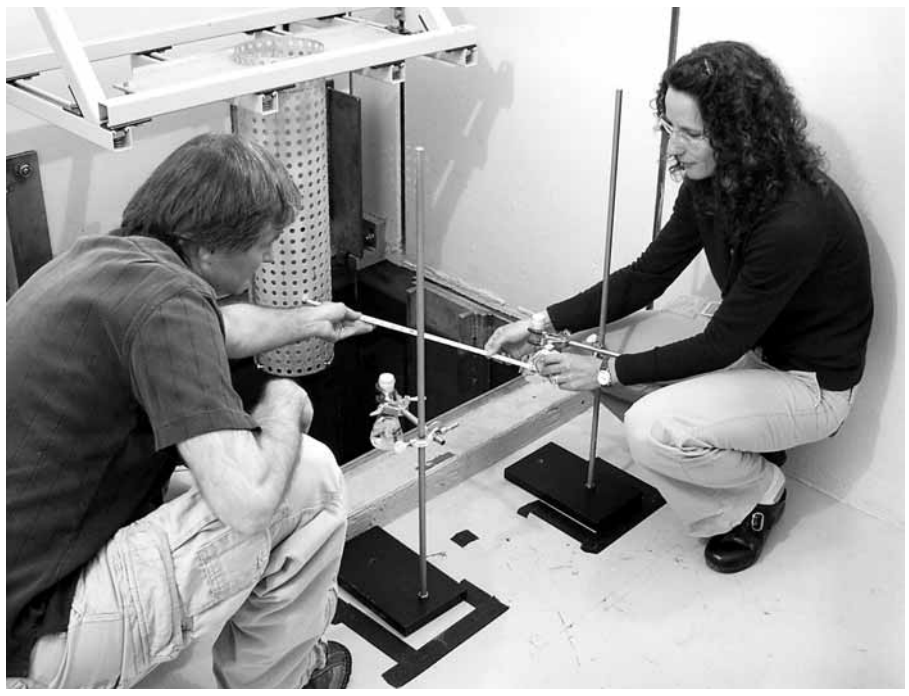
In their study of the particle growth, the researchers exposes the test solutions to even higher doses of radiation at the IBMRL.

"The ion beam irradiation experiments take place in a custom-built cell at the external beam end-station of the Tandem Van de Graff accelerator and result in intense dose rates in the solution," says Jim Knapp (1111). "A beam of protons exits the vacuum and passes through a thin Kapton film before entering into the target solution. The system can expose targets for up to several hours, but the exposures needed in these experiments are usually only fractions of a second."

Studying the outcome

After irradiation at the GIF or IBMRL, samples — none of which are radioactive — are studied using a variety of techniques, such as ultraviolet-visible spectroscopy and high-resolution transmission electron microscopy to understand what effects time and experimental variables have on particle formation, size, shape, and composition.

Depending on the combination of reactants, dose, and dose rate of radiation, researchers have been able to create nanometer-sized particles of gold in a variety of shapes including spheres, rods and pyramids.



JASON JONES AND TINA NENOFF (both 1133) set up an experiment in a testing cell at the Gamma Irradiation Facility. (Photo by Randy Montoya)

Researchers are also translating the results of these experiments into computer simulations. Kevin Leung (1133) is leading the effort to use ab initio molecular dynamics, along with other methods, to interpret and understand the controlling factors in the researchers' experiments.

"Using the results from the experiments, together with Sandia's world-class computational capabilities, we'll simulate the structure of the nanocrystal initiation," Kevin says. "By examining the free energy present in the interface between the different materials, we will be able to understand what factors govern the size of these metal alloy nanocrystals.

"Modeling this region of the metastable phase space right after radiation has been applied promises to be a new and exciting area of research."

"What we're doing is really breaking ground in fundamental research in the science of the formation of superalloy nanoparticles," Tina says. "This is really the new frontier in superalloys."

Nuclear Weapons SMU restructure boosts program strategy and integration

By Stephanie Holinka

The Nuclear Weapons SMU looks different these days. Joan Woodard, Executive VP and Deputy Labs Director for Nuclear Weapons, announced the restructuring of the SMU in April. She explained its goals in a letter to the VPs and all nuclear weapons personnel.

The new structure was created "to strengthen and improve our effectiveness with our NNSA customers in achieving their goals, to strengthen direction for program strategy and integration, and to utilize the talents of all levels of management," Joan wrote.

"That means," says Sandia VP Rick Stulen, "that the new restructure allows the individuals with the technical knowledge and responsibility to be the ones responsible for program decisions."

The new structure divides the program into strategic areas, each owned by a VP with a full-time "principal program director." VP Rick Stulen will head the NW Science and Technology strategic area; VP Paul Hommert will lead the Weapons Engineering & Technology Maturation strategic area; and VP Steve Rottler will lead the Stockpile & Weapon Product Realization strategic area. The Defense Security Program remains an integral part of the program, with management unchanged from the previous structure. David Carlson will remain as the NW SMU chief operating officer.

Dave, also director of Nuclear Weapons Planning and Integration Center 200, foresees a much stronger relationship between program and the line performing the work.

The new structure simplifies the management structure by consolidating program responsibility into the strategic areas and creating a Program Integration Council consisting of Dave and the principal program directors.

This structure will enable Joan to spend more time focusing on policy and strategic issues associated with the nuclear deterrent, Dave says.

In addition, Dave says he sees the new structure as streamlining the decision-making process and increasing the efficiency for decision-making meetings.

The VP will make decisions within his strategic area, while the Program Integration Council will address cross-program issues, with final decisions resting with the Nuclear Weapons Leadership Council.

This new process centralizes decision making and reduces the number of people involved. Overall, Joan anticipates a time savings of greater than 25 percent in terms of people's time spent in meetings. "Fewer meeting hours," says Dave "means that program leadership can spend more time providing strategic direction and engaging their customers."

Raytheon

(Continued from page 1)

the right track with the fiber laser."

Sandia was contacted to perform experiments demonstrating the laser technology. Two rounds of testing were done in New Mexico. The first round occurred indoors, at the Labs' Explosive Components Facility (Bldg. 905). The second round occurred outdoors, at the Terminal Ballistics Facility (Bldg. 6750 in Tech Area 3).

"The laser system must ignite the explosive within a munition quickly and must create a sufficiently violent reaction to minimize collateral harm."

Sandia researcher Marcia Cooper

Marcia Cooper (2554), principal investigator for both phases of the project, says the tests helped researchers understand how the time required to destroy the mortar depended on the explosive material, the mortar spin rate, and the on-target laser energy.

"Ignition and burning of explosive," Marcia says, "can vary from a somewhat benign reaction that just slightly ruptures the mortar's case to complete fragmentation of the case and rapid burning of the bulk explosive."

PRIOR TO TESTS of the Laser Area Defense System in the Explosive Components Facility, critical elements of the system were configured for stationary and spinning mortar targets.

To determine if a laser-based system is effective, researchers care about both ignition time and target lethality, Marcia says. "The laser system must ignite the explosive within a munition quickly and must create a sufficiently violent reaction to minimize collateral harm," she says. A defensive weapon cannot leave a nearly intact mortar round with a lot of explosive, Marcia says, because it could still successfully hit its target causing significant damage.

The Explosive Components Facility evaluated the laser firing on stationary and spinning mortars in a large test chamber. After those tests successfully demonstrated the laser's effectiveness in destroying the mortars, the next step was to test the laser outdoors and at long ranges.

The team wanted to show that the LADS could destroy a mortar with sufficient destructiveness to negate its threat, so that it could then be deployed in a wider array of applications — potentially even in or near land-based assets near populated areas.

In the outdoor tests, Sandia technologist David Wackerbarth (2552) says that Raytheon researchers wanted to see if they could destroy an unfuzed, 60-mm round with the laser over a long distance, in such a way that the mortar would deflagrate (burn) rather than detonate. Deflagrating a mortar destroys the mortar without the concentrated energy release of detonated explosives. It could also mean fewer mortar fragments dropping down to earth.

A LIGHT TOUCH — Marc Hagan (2554) adjusts a target mortar round before a test at the Terminal Ballistics Facility in Tech Area 3.

Target mortar was 550 yards away

The tested Phalanx system replaced the normal 20-mm Gatling gun with a continuous-wave fiber laser, usually used in industrial welding applications. The laser, which required a 270-kW diesel generator, was fiber-optically linked to the Raytheon-developed beam director located on the Phalanx mount.

The target mortar was placed on a stand some 550 yards from the Phalanx mount. The beam director consisted of a series of mirrors that positioned and focused the beam downrange to the desired spot diameter onto the target mortar. After maintaining the beam positioned on the mortar, the explosive was heated sufficiently to cause complete destruction of the casing and burning of the explosive.

Sandia's customer was pleased with the testing, according to Mike Booen, vice president of Advanced Missile Defense and Directed Energy Weapons at Raytheon Missile Systems in Tucson, Ariz.

"In just six short months, Raytheon and government engineers went from an idea to operational field testing of a solid-state laser system that offers the potential of near-term protection for our troops."

Raytheon VP Mike Booen

"In just six short months," Booen says, "Raytheon and government engineers went from an idea to operational field testing of a solid-state laser system that offers the potential of near-term protection for our troops."

"Sandia's Explosive Components Facility and the Terminal Ballistics Facility turned out to be the ideal places for these experiments," says David Wackerbarth.

The test group hopes to continue research to better understand the pre-ignition processes in explosive materials under a variety of conditions. Understanding explosive response to previously inaccessible heating rates, says Marcia, will advance Sandia's own thermal hazards program while aiding in the development of a roadmap for force protection deployment of a LADS-type system.

Science fair

(Continued from page 1)

Practical Supermaterial?"

Intel officials seconded Sandia's judgment by presenting Streich one of the Intel Foundation Young Scientist Awards, which honored the top three students at the Intel ISEF with $50,000 scholarships. The science fair was held May 13-19 in Albuquerque.

Sandia's award was for the best project related to the application of nanotechnology in one of three categories: materials & bioengineering, electrical & mechanical engineering, or chemistry. Streich's project, from the chemistry category, was selected by Labs researchers Tim Boyle (1815), Justine Johannes (1810), and Jeff Brinker (1002).

"All these students were very impressive," Jeff says. "They were competent, they understood the field — but this guy stood out in accomplishing something that seemed to be pretty amazing. He posed a very fundamental question about a very important issue."

By designing and creating an ultrasensitive photon-counting spectrometer with spare parts he found in the University of Wisconsin Chemistry Department, Streich discovered the first evidence that carbon nanotubes, which are incredibly strong and conductive, are thermodynamically soluble, a characteristic some experts think could potentially lead to developing nanotubes as a supermaterial.

Along with awarding Streich the scholarship, Sandia invited him to participate in an all-expenses-paid two-week internship at the Labs this summer. All award-winning ISEF participants are also eligible to apply for one of these 15 special Sandia internships. Selected students will stay in dorms at Menaul High School and get hands-on experience in cyber security and materials science/forensics. Watch the *Lab News* for more.

Tests posed daunting safety challenges

Experimenting outdoors with a powerful laser-based weapons system such as LADS provided many safety challenges and required careful planning and execution, says Kevin Fleming (2554), the laser safety officer on the project. He notes that all test procedures, hazards analysis, and hazard mitigation processes were reviewed by the Sandia, Air Force Research Lab, and Raytheon safety organizations, KAFB's Controlled Firing Area Committee, and DOE.

Kevin calls the tests "one of the most challenging scenarios" he's ever seen.

"Anything over a class 3a or 3b laser light is considered eye-damaging," Kevin says, "and these tests used a class 4 laser of very high power that was also invisible." To ensure that the beam could not be elevated above the horizontal, the laser and beam-directing optics were firmly anchored to prevent any off-target movement.

Kevin says that prior to each test, the group had to notify the airport, Kirtland Base Operations, and Tech Area 3 neighbors like the Sled Track. A log was maintained to record the time and duration that the laser was powered on. The FAA had to be notified well in advance, Kevin says, adding that during the field tests, spotters made sure there were no aircraft within a one-nautical-mile bubble around the testing grounds.

"There was a huge safety component to this project because we wanted to eliminate any possibility for injury to the team or anyone else in the area," Kevin says.

A CORPORATE COMMITMENT TO OUR GUARD AND RESERVE

EMPLOYER SUPPORT OF THE GUARD AND RESERVE

ON GUARD

New Mexico units show their stuff during Bosslift exercise

Photos by Bill Doty & Tom McMahon

BRIG. GEN. (RET) Steve Stevens (center), chairman of the New Mexico Committee for Employer Support of the Guard and Reserve program, visits with Guard and Reserve members from (left to right) the New Mexico Air National Guard, the Navy Reserve, the Marine Reserve, and the New Mexico Army National Guard.

ON TARGET — A New Mexico Air National Guard F-16 (left) wheels away after dropping a dummy bomb on a target (right) at the Melrose Range near Clovis, N.M. The target aircraft are plywood mockups.

ARMY NATIONAL GUARD members (above) discuss how they will deploy to protect a landing zone for an air rescue mission. In the sequence of photos below, a Guard helicopter drops into a hot zone to recover a downed pilot.

Suddenly, the F-16 is just *there.*

I'm lying in a prone position on a bench at the tail end of a KC-135 aerial tanker looking out a small window. Beside me, "Boomer," an Air National Guard sergeant and refueling boom operator from an Ohio Guard unit, looks over at me and gives a slight nod and smile. I'm the civilian newbie here and he's saying to me, without words, "This is cool, isn't it?"

Yes it is.

Boomer, hands on a panel of controls, deftly flies the refueling boom — yes, flies; the business end of the hose includes small winglets that aid in positioning — into the receiving port on the F-16. He's in visual communication with the F-16 pilot; the cockpit of the New Mexico Air National Guard fighter aircraft isn't more than 50 feet from our window. We're close enough that you can see the intensity of the pilot's concentration as he keeps the F-16 straight and level and exactly synced to the speed of the tanker.

Boomer's in constant voice contact with the pilot. Though I can't make out the individual words, I can hear him speaking in the low, slow, confident cadences of a man who knows what he's doing and has done it thousands of times before.

A flight of four F-16s from the New Mexico Air National Guard has been flying along with the tanker on a short hop from Kirtland Air Force Base to Cannon AFB in Clovis. The purpose of the flight is to practice (and frankly, to show off) the Guard's aerial refueling capabilities — and to impress those of us who don't see this stuff every day.

We're impressed.

That Ohio Guard unit, the 121st Aerial Refueling Wing, has dispatched the KC-135 to New Mexico to support an annual event called Bosslift, which is intended to showcase New Mexico Guard and Reserve capabilities to local business and civic leaders.

Bosslift is staged by the New Mexico Employer Support of the Guard and Reserve (ESGR) program.

Sandia has been invited along on Bosslift because it is widely recognized as one of the state's best — that is, most enlightened — employers of Guard and Reserve members. Altogether, about 100 people from businesses around the state have joined in the Bosslift exercise.

The morning had started out with briefings at KAFB about New Mexico's Guard and Reserve capabilities. Steve Stevens, a retired brigadier general and head of New Mexico ESGR, brags on the caliber of Guard and Reserve members and argues that compared to the nation's regular military services, the Guard and Reserve deliver at "pennies on the dollar."

"We think we're a pretty good bargain for your tax dollar," he says.

New Mexico Air National Guard commander Col. Jay Bledsoe speaks next. He looks like the one-time Detroit Lion he was, a big, rangy guy whose cockpit callsign is "Bluto." (If you know *Animal House,* that handle probably tells you something about Bledsoe.) He tells us that his unit — our neighbors and colleagues in the workplace — are "fully integrated in the war on terror. Our operational tempo is very high . . . we've never been busier."

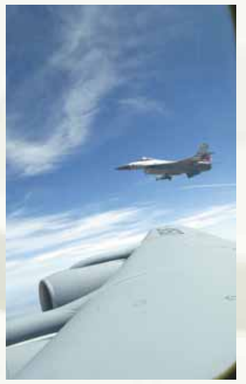
In Clovis, we get more briefings on Guard and Reserve activities, both at home and in the global war on terror (New Mexico Guard and Reserve units are routinely deployed in Iraq and Afghanistan). During a banquet, Brig. Gen. Kenny Montoya, adjutant general of the New Mexico National Guard, tells us that he's proud of the moniker "weekend warriors," emblematic as it is of neighbors and work colleagues who have answered the nation's call to serve.

On Bosslift day two, we're bused out to Melrose Range near Clovis to watch F-16s do practice bombing and strafing runs, then see an Army Guard unit do a rescue mission of a downed pilot while coming under fire from a band of insurgents.

As we board the KC-135 for the flight home, all we can talk about is how impressed we are with everything we've seen. To a person, we're convinced that our New Mexico Guard and Reserve members — including soldiers, sailors, airmen, and Marines who work shoulder to shoulder with us at Sandia — are, as Steve Stevens said during a briefing, "a cut above the average."

— Bill Murphy

NM GUARD Adjutant General Kenny Montoya (left photo) provides a mission briefing. In photo above, Guard and Reserve members discuss coordinating a training exercise. In right photo, Montoya talks with NM Air National Guard commander Col. Jay Bledsoe.



FILL 'ER UP — An NMANG F-16 moves into position below a KC-135 aerial refueling aircraft in the skies high above New Mexico.

TOOLS OF THE TRADE — A Marine Reserve recon unit exhibits some of the gear it uses in carrying out its mission.

CHARGE! — "Insurgents," played by Guard members, attack a helicopter landing zone.

A NM GUARD member in combat face paint.

TAKE FIVE — Guard members take a break before a firefight demonstration.

Sandia assists 293 small businesses in 2006

Projects range from a siren for first responders to a car organizer for kids

By Michael Padilla

Sandia assisted 293 small businesses in 2006 with projects ranging from a kids' car organizer to a radio frequency signal that can alert 85-90 percent of drivers that a first responder is approaching.

This was Sandia's sixth year of helping small businesses through the New Mexico Small Business Assistance Program, thanks to a tax credit passed by the New Mexico Legislature.

THE KIDS CONSOLE, by Baby Azul.

The program allows Sandia to apply a portion of the gross receipts taxes it pays to the state each year to provide technical advice and assistance to New Mexico small businesses. During 2006, Sandia received nearly $1.8 million in tax credits.

Due to successful legislation in 2007 the program has made some significant changes, says Jennifer Kamm Sinsabaugh (9118). Los Alamos National Laboratory now has the same program and the maximum amount of tax credit was increased from $1.8 million to $2.4 million for each participating laboratory.

There are few requirements for small-business participation — mainly that assisted companies must be for-profit New Mexico small businesses, and that the help is otherwise not available for a reasonable cost through private sources.

Car organizer for kids

Utilizing Sandia's rapid prototyping technology, Bart Chavez (2455) built the first prototype of a new car organizer for kids.

The Kids Console, by Baby Azul, is the only car organizer that is reachable and usable by children strapped in child safety seats. The organizer can be placed on a bench seat or between bucket seats and allows children access to their cups, books, or toys. An extra storage compartment in the console can be used for items that parents want to keep out of reach of their children. The console is held securely in place with the seat belt on a bench seat and with a strap system when placed between bucket seats.

The Sandia assistance involved computer-aided design model analysis, stereolithography (STL) file generation, STL file verification, rapid prototyping (RP), and post-processing of the Kids Console RP model. The model allowed for the product to be shown at trade shows and to generate interest.

The New Mexico Manufacturing Extension Partnership assisted Baby Azul by developing a manufacturing feasibility study.

When company representatives attended their first trade show, they received positive feedback that encouraged them to press forward and have the Kids Console product manufactured. Without the prototype, Baby Azul would have not gone to the trade show and not pursued the idea any further, says Dawn Winters-Rizika, owner of Baby Azul.

"It is always an honor to work with the innovative and remarkable individuals in our community," says Bart, who has helped with about 10 other small business projects over the years.

"I support the [New Mexico Small Business Assistance] program 100 percent. It's great to help people with their ideas."

Winters-Rizika says the Sandia program played an essential part in helping her bring the Kids Console to market.

"We will be receiving our first shipment at the end of June and this wouldn't be happening if I hadn't received my first prototype from Sandia Labs," she says. "Sandia has helped make my idea come to life."

Emergency vehicle approaching

Force 4 Enterprises in Albuquerque has created an alert system that first responders — police, firefighters, ambulance companies — can use to alert motorists of their approach when navigating through traffic during an emergency.

Michael Frasier, co-owner of Force 4, says the system will alert motorists by sending a message or tone, which can be heard on the existing sound system of any motor vehicle if the operator is listening to any publicly broadcast radio station. This amounts to nearly 90 percent of vehicles on the road, according to Arbitron Radio Ratings and Media Research, he says.

"No one has managed to bring this technology forward," Frasier says. "We're using common technology in a way that has never been used before."

The Eagle 1000 RF Siren can be detected a quarter of a mile from the approaching first responder and the area of complete capture is nearly one-tenth of a mile, he said.

First responders have traditionally relied on conventional audio sirens to warn motorists that they are approaching. Over the years, their effectiveness has been reduced by better soundproofing in today's automobiles, Frasier says. Automobile accidents are the number one hazard facing first responders and accidents have been the leading cause of police officer deaths for the last eight years, says Frasier, citing the National Law Enforcement Officers Memorial Fund.

"Our mission is to improve the safety of the general public and for first responders when and where they interact," he says.

Sandia retiree Richard Sparks assisted Force 4 with engineering and research guidance on the Eagle 1000 RF Siren. Richard called on 38 years of experience in assisting with radar and RF transmission issues.

BART CHAVEZ used Sandia's rapid prototyping technology to build the first prototype of the Kids Console.

Richard also provided Force 4 a number of contacts from the Center for Commercialization and Entrepreneurial Training and the National Institute of Justice.

"The idea that Michael Frasier is pursuing could save many lives that are lost across the country when people are unaware of emergency vehicles approaching and fail to yield," Richard says. Force 4 is in a circuit design stage moving into a test phase within the next few months.

Small businesses highlighted

Baby Azul and **Force 4** were among eight success stories from the 2006 New Mexico Small Business Assistance Program featured at an event at La Fonda Hotel in Santa Fe recently. The other six include:

• **LaLuz Technologies, Inc.**, formerly Entereza Network Solutions in Albuquerque, started in July 2001 as a professional services organization focused on testing and evaluating government systems, as well as various type of training efforts. In January 2006, the company was introduced to a new technology, a laser wind velocimeter that has the capability to look at and define clear air turbulence. This technology can be used to measure events such as clear air turbulence, microbursts, wake vortexes, and wind shear at airports and heliports. Michael Murphy (5356) served as Sandia principal investigator.

• **Los Alamos Renewable Energy, LLC (LARE),** in Pojoaque, N.M., was established in 2004 by Reed Jensen and David Jones. It immediately acquired majority ownership of Renewable Energy Corporation (RECO), which was established in 1998 by Jensen. LARE is a pioneer in the solar production of fuels through CO_2 splitting (dissociation) with associated electricity production from the high-temperature dissociation process. LARE has been refining its process called SOLAREC (SOLAr REduction of Carbon) at its development site in Pojoaque. LARE's prototype is currently successful at splitting CO_2 at a commercially viable level. Rich Diver (6337) served as Sandia principal investigator.

• **The Visualization Sandbox** group in Santa Fe and Albuquerque combines multiple domains of subject-matter expertise ranging from simulation, visualization, and modeling to applied complexity, business management, and new product development. The Sandia-aided project's goal is to develop tools and capabilities that will enable decision makers to reduce risk and increase time to market for highly complex business and environmental situations. Carl Diegert (1412) served as Sandia principal investigator.

• **Altela, Inc.,** in Albuquerque provides products and services to customers who need to recover pure water from highly salinated and contaminated water sources. Through the use of its proprietary, patented AltelaRain™ technology, Altela desalinates and decontaminates highly challenged water sources without the energy-intensive equipment, high temperatures, or high pressures of other water desalination technologies, such as reverse osmosis. John Torczynski (1513) served as Sandia principal investigator.

• **Fabtec Solutions, LLC**, in Farmington, N.M., is one of the leading oil, gas, and mining equipment developers/fabricators in the Four Corners area. Previous projects developed and fabricated by Fabtec include: air handling systems for locomotives and mining excavation equipment, air filter cleaning/recycling equipment, oil tank refurbishing, and oil pipeline radio-graphy robotics. Multiple shock tests at the Mechanical Shock Test Facility at Sandia were conducted to evaluate the response and reliability of Fabtec's electronic image producer device. Luis Abeyta (1535) served as Sandia principal investigator.

• **Satyrne Biotechnologies** is a new company that develops highly differentiated implants and surgical guidance software for traumatic skull fractures. Satyrne's products drastically reduce surgery time and patient complications, saving US hospitals, insurance companies, and patients millions of dollars annually. Anderson Schools of Management – Management Technology served as principal investigator.

Darrick Hurst's band Man Born Blind wins two first-place awards in New Mexico Music Festival

New Mexico 'Grammy' awards may boost Sandia student aide's music career

By Neal Singer

Photo by Randy Montoya

As I drove into Colorado almost a year ago with two women of disparate ages, I played a CD titled Man Born Blind. *My wife said, "Wow, who is that? They're very good." My son's girlfriend said, "They seem very well structured."*

I thought they were good too, but because the disk was given to me by Darrick Hurst — a student aide in my office who's a member of the band — I didn't totally trust my judgment. I like listening to people whom I know, play. But when two women with divergent tastes both liked the disk, for the first time I thought maybe it was really as good as I felt it was.

* * *

It's Sunday night in late May. Darrick Hurst (3651), 23, is waiting in line at the Marriott-Pyramid for his ticket to enter the equivalent of the New Mexico Grammy Awards — formally, the New Mexico Music Awards. He's a finalist, but things aren't looking good. Just behind Darrick is a musician who is not only a finalist but has been pre-chosen by management to be part of the night's entertainment. With him in line, providing visual glow, is a beautiful blonde in a red dress.

Darrick's band members are too busy or too broke to make the ceremony. They weren't invited to perform anyway. For visual glow, Darrick has only his parents. They stand patiently in line with him.

Some might claim that Mike and Joan Hurst lack band panache. Unlike, for example, the young guitarist in front of them, whose flowing blond hair is arranged in a pony tail and who wears wraparound sunglasses in the dimly lit meeting room, Darrick's parents do not look like they may stay up all night defining a certain beat. They do not resemble the Indians from Jemez Pueblo in colorful dance costumes, country western singers in embroidered shirts and silver-inlaid belts, young rap groups in jeans, and people "of the Tradition" who sing movingly in Spanish.

'As long as he gets his education'

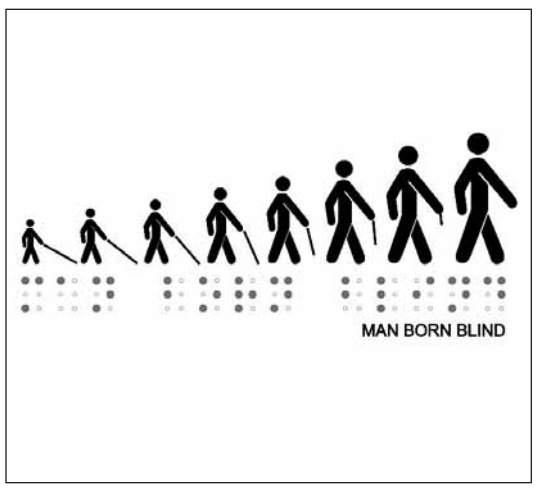
Mike Hurst (5353) wears a dark blue suit and dark blue tie. He looks like a Sandia engineer attending his son's graduation.

"Music is good as a hobby," says Mike. "As long as he gets his education."

Darrick's charming mother — a professional embroiderer — stands loyally by.

Some young people would prefer their parents not attend, so that the new generation can assert its independence. Darrick feels differently.

"I thought, after all they've put up with, they deserve to be taken out to dinner," Darrick tells the *Lab News* as the trio wait in line.



DARRICK HURST won a New Mexico "Grammy" award for his design of the *Man Born Blind* album cover. Darrick's group, Man Born Blind, also won an award for best alternative rock song, "Safety Net."

It may be that Darrick's experience with music groups since junior high has taught him wisdom not generally associated with rock bands.

"A lot of being in a band comes down to compromise," he says. "Playing an instrument in a band isn't just a collision of sound — you have to stop and listen to each other. It's something I had to learn."

It also requires determination and patience. Lead singer Nate Jackson, who plays acoustic guitar and writes almost all of the band's lyrics, is married and works weekends as an ambulance paramedic. Weekends, of course, are when a start-up band seeks exposure in local bars. He's trying to switch his hours.

Drummer John Romano works for Big J Construction Co. in the machine shop; he shares an apartment with bassist Jon Shores (1762). Darrick sometimes crashes there when band practice stretches too late to go home to his room in his parents' home. Darrick — who is also a fifth-year double-major UNM student with a high GPA — has a busy life.

Dropping the destructive things

This doesn't stop him from thinking about the band's musical aims, which are less about individualism than one might think.

"We try to drop things destructive to the end goal of the music, and do that without hurting anyone's feelings," he says.

Destructive actions include "instrumental self-indulgent solos that are more distraction than edifying in a piece of music."

Positive results come from working together. "When we write a song, it'll sound entirely different a few months later. We change the rhythm, the words."

With all this community feeling, how do songs actually get written? "[Lead singer] Nate has an interesting ability to look at humanity and condense down what he sees into stories, which he turns into songs," Darrick says. "He comes in and plays a set of chords [at band rehearsals], or maybe he just has lyrics and we try to find music. If the development of a song seems to be moving away from the feeling of the lyrics, we attempt to be sensitive to that."

Reconciling this tender approach with the reality of rock stardom as it exists — the big stage, thousands of fans, bizarre behavior — is not easy, he recognizes.

Countering celebrity-ization

"Communication with the audience [today] takes a back seat to the celebrity-ization of music. It sabotages the intent of your music, which is to effectively communicate with people. That's a disparity in the way the world works. As a musician, you have a little sliver of an opportunity to communicate, just a chance to push the world a little bit in the direction for positive change, but there are difficulties."

The star treatment is one. "You lose touch with reality," he theorizes. "Just because you have a platform doesn't mean you should be put on a pedestal. If you're writing stuff relevant to people, you have to stay in touch with what keeps you rooted in your inspiration."

Darrick has had fun experimenting with flashing lights and smoke machines but, he says, "it doesn't leave you with anything lasting. We want something where people are drawn to the performance, but not overpowered from the core goal, which is to pay attention to the music itself and whatever story it's trying to tell."

The group's story wins first place in two categories: best album design and best alternative rock song, "Safety Net."

The cover, designed by Darrick (see graphic at left), begins on the left with a baby holding a blind man's cane. In a series of images, the cane gets shorter and finally disappears as the baby enlarges into an adult. The design, he says, "is a hopeful message depicting that we can become more clear-sighted as we get older."

"Safety Net," written by Nate, is a lengthy, emotionally moving piece in which Darrick plays a catchy guitar backup.

Impossible not to like him

While other winners had groups of followers who cheered and whistled their arrival at the podium, young Darrick in his simple jeans and T-shirt was greeted mostly by silence and curiosity. His composure was unbroken, however. "Quite a night," he said pleasantly over the microphone to several hundred attendees when he was called up for a second award. He also had the presence of mind to mention he'd consider signing up for guitar lessons from a particularly dynamic guitarist who stunned the audience with his expertise just prior to Darrick's award announcement.

It was impossible not to like him and he was cheered as he left the podium. "It doesn't hurt that he looks like Brad Pitt," quietly commented Doug Geist of Santa Fe Center sound studios, which recorded the group's CD.

"Not bad work, for a hobby," says his dad as Darrick rejoins his parents with his second award.

* * *

However. Ever since listening to the Man Born Blind *CD, whenever I see Darrick walk some errand through our building in his self-effacing way — in his old jeans, T-shirt, soft shoes, and stand-up hair that looks like he just got up except that's the style — I see another Darrick walking behind him. This Darrick is translucent, I can see through him, but he has in fact a limousine at his beckoning, asks caterers for only the brown M&Ms, and has his hotel room furniture put out by poolside. In short, in some alternative universe, Darrick Hurst has been discovered. He's a rock star, worth millions of dollars. It just so happens that in this universe, for now, he faxes and copies and sometimes writes for the* Lab News. *But the transition could happen any time. Be ready for a call from* Rolling Stone Magazine. *Be ready.*

Mileposts

New Mexico photos by Michelle Fleming
California photos by Randy Wong

Terry Bersie
40 8945

David Haaland
35 8332

Recent Retiree

Johann Seamen
37 1671

Dennis Berry
30 6800

Ken Buck
30 8948

Don Noack
30 12001

Craig Tyner
30 9104

Paul Lari
25 8229

Rosemae McKillip
25 10507

Thomas Brown
20 12347

David Gelet
20 2125

Roxana Jansma
20 5631

Jeffrey Kallio
20 10530

M. Bradley Parks
20 6410

Thomas Wubbels
20 3654

Gregory Wyss
20 6462

Lane Yarrington
20 5614

Russell Clark
15 4537

James Clinch
15 9105

Bryan Drennan
15 10322

Amir Mohagheghi
15 6721

Diana Darlene Rutan
15 10507

DeAnna Spulak
15 510

Dann Ward
15 10328

Mark Wong
15 10326

Tonopah Test Range Family Day

Family members came out to Sandia's Tonopah Test Range in late April for a range-wide Family Day celebration.

Visitors were permitted to remain on range overnight in US Air Force dorm rooms. The Air Force also hosted a barbecue dinner for visitors. In one of the highlights of the day, the TTR contract security force (U.S. Security Associates, Inc.) conducted live-fire demonstrations at the Live Fire Range. Washington Group International, the Sandia/TTR O&M subcontractor, provided transportation/shuttle services for range tours.

Preparation for the Sandia/TTR Family Day was a joint effort involving Sandia, U.S. Security Associates, Inc., Washington Group International, and the Air Force. Range Manager Vern Gabbard (2915) and Safeguards and Security Director Mike Hazen (4200) expedited and approved the security plan.

Self-proclaimed jock Dick Fate walks a star down the aisle

By Iris Aboytes

Note: Dick Fate visited with me while he was being fitted for a prosthesis. We agreed to tell his story in the Lab News *after his daughter's wedding. See the photo at right to see if his wish came true. — Iris Aboytes*

Activist Heather Mills switches prostheses for flexibility as she goes from one dance to another in "Dancing with the Stars." Dick Fate (6483) just wants to be able to walk his daughter Jessica down the aisle on her wedding day.

Dick is a self-proclaimed jock; cancer was not a part of his equation — until he was forced to confront it. Diagnosed with soft tissue sarcoma 12 years ago, Dick had undergone surgery after surgery to try to check the spread of the disease. He had the last two of 10 surgeries in late October and December at the M.D. Anderson Cancer Center in Houston. One surgery removed his left leg at the hip and created a stump by attaching a section from his tibia (lower leg) where his femur should be. The other surgery shaped the stump in preparation for a prosthesis. "I have very little muscle, no calf, no real power source," says Dick. "With the little bit of muscle I do have, I can actually move my stump back and forth a little. I intend to strengthen it enough to use it to walk again."

CLIMBING CABEZON PEAK — Before one of his trips to Houston for surgery, Dick and some friends climb to the summit of Cabezon Peak. (Photo by Tim Goering)

Dick's type of surgery had never been performed before. "Removing the leg was the only option," he says. "The operations to save the leg became less and less effective. They were accomplishing very little. It was a fair trade — my leg for my life. I am lucky. I believe I have gotten rid of the cancer and have gotten my life back. I can start planning for the future. I can live a life that is as normal as my limitations allow. I am very happy. I will be able to walk and hike again.

"I will not be able to run again, but that's OK," he says. "My daughter Ashley, who was age 16 at the time, accompanied me to Houston for the surgery that ended my running," says Dick. "The night before surgery, I told her that I would be going for my last run at 4 a.m. before going to the hospital at 6 a.m. She said she would try to go running with me. At 4 a.m. I tapped her on the shoulder and told her I was going to go running in 10 minutes. I wasn't sure she would get up, but she did. She and I ran together. We did not run fast, but we ran together. That run was as meaningful a run as any marathon I had been in. Running with her the last time made giving up my running easier.

"My cancer is rare and very aggressive," says Dick. "Since it is rare, there is little research money available." After his initial diagnosis and treatment, he was in remission for three to four years. He was able to bike, run in marathons, and hike. But the cancer came back.

DICK FATE walks his daughter Jessica down the aisle on her wedding day.

In February 2005, Dick competed in the 22nd annual Mt. Taylor Quadrathlon near Grants. (See March 4, 2005, *Lab News*) He was part of a four-person team who called themselves "Three Gimps and a Geek." With the aid of a leg brace, and ski poles for stability, Dick walked 10 miles in the race, five of them uphill (an elevation gain of 1,200 feet) and five downhill averaging 17 minutes a mile. In this event, as with many of the other things Dick did on his journey through cancer, he relied heavily on the support of his family, friends, and coworkers.

Dick has three children: Jessica, 25; Rickie Jr., 23; and Ashley, 21. "Depending on their age, there were different levels of understanding my cancer, but they were always very supportive and helpful in their own way."

Dick is in physical therapy to learn to use his new prosthetic leg. He says it is high tech, with a microprocessor-controlled knee.

He is counting on walking his daughter down the aisle. He says if he is not confident he will be able to walk unassisted, he will use a cane or crutches. "I will not jeopardize her special day by falling and becoming the center of attention," he says. "My daughter will be the star. I will just be the bride's proud father."

Choosing your primary care doctor

By Margaret Lovell (3654)

Note: The following article was provided to the Lab News *by Sandia's Benefits organization. This is the first in a series of articles over the next few issues regarding benefits-related subjects.*

* * *

Maybe you're new to Sandia and have just enrolled in a health care plan. Maybe you've been on a Sandia health plan for years and have just found out that your doctor is retiring. Perhaps your physician is no longer on the list of preferred providers for your plan. Or maybe you just feel you need to make a change. Whatever your situation, if you don't have a primary care physician already, or are about to lose the one you have, you should get one. And in choosing the right doctor, there's a lot more involved than just going through the phone book. Here are some things to think about.

Questions to ask yourself

Having a qualified doctor that you trust and see regularly is an important part of staying healthy. Getting routine checkups and screenings can help you avoid serious health problems. And, if you develop a chronic condition that needs long-term or specialized care, your doctor can help you find the treatment that is right for you.

To select a physician, here are some things to ask yourself:

- Does location matter to you?
- How about the age of the physician, or gender?
- Which hospital(s) can your provider admit you to?
- Is the physician board certified?
- Is the physician covered as in-network under your plan?

The CIGNA In-Network Plan, the Kaiser Permanente HMO/Senior Advantage Plan, and the Lovelace Senior Plan generally don't provide coverage for services rendered by providers who are not in their network. Depending on which plan you are enrolled in, if you visit myuhc.com, mycigna.com, or members.kaiserpermanente.org you can find out if the provider you are interested in is an in-network provider.

Maybe you are interested in gauging the doctor's adherence to quality of care and cost-effectiveness by reviewing his or her ratings against national standards. Large insurance companies such as UnitedHealthcare (UHC), CIGNA, and Kaiser Permanente are adopting procedures to systematically assess a physician's quality and cost efficiency relative to other docs. They present the ratings to you, the plan participant, via the Internet. By meeting certain national standards of care and cost efficiency, physicians, like the facilities they work in, will be value scored and assessed on the quality and efficiency of the care they provide.

You've found a doc — now what?

Say you've answered the questions above to your satisfaction and you've found a new doctor. Now what?

At your first appointment with a new doctor, you may want to ask about his or her continuing-education efforts and whether he or she is on the faculty of a teaching hospital or is board certified. Perhaps you want to learn the doctor's plans for helping keep you well, including what is covered in your regular physical. Does the provider's office understand what is covered under your health insurance for annual exams? What routine procedures will the physician or the nurse provide each time you visit the office? Has the doctor received specialized training in any aspect of medicine or alternative treatments? How does the doctor ensure he or she refers you to other providers who are in-network? How does the doctor respond to questions about getting second opinions or advance directives ("living wills")?

After this first visit, ask yourself how you felt about the experience. Did the doctor listen to you? Did the answers you received let you know that your questions mattered? Were the answers clear and easy to understand? Would you feel comfortable asking this person a "silly" question? Would you trust this doctor to be your advocate if you were disabled or faced with a complicated health condition?

You're in the driver's seat

If you feel that you and the doctor are a good match, schedule your next appointment. Request that your records from your previous health care professionals be forwarded to your new doctor.

By the time you see the doctor, you probably will have completed an extensive health questionnaire. Expect your doctor to review your medical history — and that of your family — with you. Bring a list of your current medications and a list of questions you may have. Be honest about your habits. Ask questions if you don't understand something. If you feel rushed or worried about something, say so. Take notes.

Remember, you are in the driver's seat when it comes to your health. Speak up. Make sure your concerns are addressed. Ask questions and stay informed. Only you can ensure that you receive the care that best suits your needs.