Sandia LabNews

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Sandia National Laboratories

'Tomorrow is built today'

Sandia President and Laboratories Director Paul Hommert will hold a meeting on the state of the Labs on Thursday, Sept. 13, 10-11:30 a.m. MDT. Videoconferencing will be provided to Sandia/California's Bldg. 915/N132. The meeting, at the Steve Schiff Auditorium, is open to all members of the workforce. It will be videostreamed live to all other Sandia sites and will be available later for on-demand viewing. All Sandia sites may participate in the Q&A session.

Scientific 'breakeven' or better is near-term goal

Experiments verify key aspect of Sandia nuclear fusion concept

NOT YOUR USUAL BIRTHDAY CAKE — Ryan McBride (1648) pays close attention to the tiny central beryllium liner that will be imploded by the intense magnetic field generated by the Z machine's huge electrical current. This will happen in the next of a run of tests to create a mechanism to achieve scientific break-even or better in dry-run nuclear fusion experiments. The larger cylinders forming a circle on the exterior of the base plate measure Z's load current by picking up the generated magnetic field. (Photo by Randy Montoya)

By Neal Singer

Magnetically imploded tubes called liners, intended to help produce nuclear fusion conditions at scientific "break-even" energies or better within the next few years, have functioned successfully in preliminary tests at Sandia, according to a paper slated for publication on Sept. 14 in *Physical Review Letters* (PRL).

Exceeding scientific break-even is the holy grail of fusion research, where the energy released by a fusion reaction is greater than the energy put into it — an achievement that would have extraordinary energy and defense implications.

That the liners survived their electromagnetic drubbing is a key step in stimulating further testing of a Sandia nuclear fusion concept called MagLIF (Magnetized Liner Inertial Fusion), which will use magnetic fields and laser preheating in the quest for energetic fusion.

In the dry-run experiments, cylindrical beryllium liners remained reasonably intact as they were

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A human tapestry

Groups nurture diversity to bring out the best in Sandia

By Nancy Salem

Diversity at Sandia lives in many faces. People of different skin colors, birth places, shapes, sizes, hairdos, dress styles, interests, and inclinations walk through the Labs' doors every day.

Making sure each one feels accepted and valued is the mission of Esther Hernandez, a senior manager who heads up Diversity & Inclusion Org. 3010. Esther started the job nearly three years ago with the goal of integrating various diversity efforts under way at Sandia/New Mexico and Sandia/California.

"There were a number of groups with ties to diversity, but each was doing its own thing," Esther says. "Now there's a framework, a diversity plan aimed at building an inclusive environment at Sandia."

The Corporate Diversity Team (CDT) was formed in 1993 and includes members of the workforce who promote diversity-related activities within divisions. The Executive Diversity Council (EDC), established in 2008, is made up of 11 directors from across the Labs who advise and engage executive management and help develop diversity strategies.

"Great work was being done by great people," says Becky Krauss, VP of Legal Div. 11000 and chair of the EDC. "But because there was no framework or focus, the impact was limited. Esther's position was created to do that, to leverage what was being done and to formalize and shine a spotlight on diversity."

(Continued on page 5)

Lifelike, cost-effective Sandia Hand can disable IEDs

By Stephanie Hobby

Sandia has developed a cost-effective robotic hand that can be used in disarming improvised explosive devices, or IEDs.

The Sandia Hand addresses challenges that have prevented widespread adoption of other robotic hands, such as cost, durability, dexterity, and modularity.

"Current iterations of robotic hands can cost more than $250,000. We need the flexibility and capability of a robotic hand to save human lives, and it needs to be priced for wide distribution to troops," says Sandia senior manager Philip Heermann (6530).

The Sandia Hand project is funded by the Defense Advanced Research Projects Agency.

Principal investigator Curt Salisbury (6533) says the goal was to build a capable but affordable robotic system.

"Hands are considered the most difficult part of the robotic system, and are also the least available due to the need for high dexterity at a low cost," Curt says.

GET A GRIP — The Sandia Hand deftly demonstrates its dexterity. (Photo by Randy Montoya)

The Sandia Hand is modular, so different types of fingers can be attached

(Continued on page 5)

New Assurance Information System will help Sandia manage risk

By Chris Miller

Following the Oct. 9, 2008, sled track accident, an exhaustive investigation was undertaken to determine why the accident occurred and to ensure it would never happen again.

When the sled track started up again 16 months later, its operations had much improved. But the investigative task of gathering previous assurance information about the sled track — including identified risks, prior evaluations, and corrective actions — proved difficult and time-consuming.

The implementation of a new Assurance Information System (AIS) on Sept. 19 will

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Inside . . .

World champs

Sandia manager Reno Sanchez coaches Albuquerque girls all the way to the Little League softball world championship. See story on page 12.

Researchers seek better understanding of memory . . . page 6

That's that

He chose not to bask in glory. Not to rest on laurels. He spurned celebrity; indeed, he seemed to scorn it. He certainly didn't need it. He could have made a career of his fame, but that wasn't Neil Armstrong's way. In his death, countless words will be written about Armstrong, recalling the heroic part he played in the US manned space program, culminating with his first step on the moon at Tranquility Base.

Like so many others, when I heard of Neil Armstrong's passing, I found myself thinking back on that incredible day just over 43 years ago when he announced that "The *Eagle* has landed." Now that he is gone, it seems to me that regardless of what we thought we heard, we should take Neil at his word when he repeatedly asserted over the years that he had been misunderstood. He did *not* say, he insisted, "That's one small step for man" but "That's one small step for *a* man." *A* man. Because that's what Neil wanted all of us to understand: He was speaking very specifically about himself. He was a man. And just a man.

For the longest time, I thought Armstrong was being unnecessarily prickly over the issue. But the quote — the quote as he meant to deliver it — explains so much about why he shunned the limelight: He was self-aware enough to recognize that his accomplishments were not his alone, that his truly was just "one small step," that the Apollo landing was a collective American triumph and, indeed, a triumph of the human spirit. He was saying, "Yes, I played a part, but a small part. I was the traveler, but others made the vessel that carried me to this place. I am here because I was born in America at a fortuitous time. I did well in school and could fly a mean aircraft, but so could others. It took a lot of small steps by a lot of people to get to the moon. Mine was one of them. But only one of them."

After years of trying to get people to hear something they couldn't hear, later in his life Armstrong acknowledged that maybe that stray syllable, that missing "a" really wasn't there, after all. He was quoted, finally, as saying that he hoped history "would grant me leeway for dropping the syllable and understand that it was certainly intended, even if it was not said — although it might actually have been."

Some former astronauts have organized their lives around their (relatively) youthful accomplishments, becoming professional ex-astronauts, tacitly acknowledging that their greatest days were behind them. Neil Armstrong took a different approach. He seemed determined not to define himself as the first man on the moon, at least not solely in those terms. Let others do that. Neil would define himself, and his own self-identity is revealing. In remarks at the National Press Club in the year 2000, he said, *"I am, and ever will be, a white-socks, pocket-protector, nerdy engineer, born under the second law of thermodynamics, steeped in steam tables, in love with free-body diagrams, transformed by Laplace, and propelled by compressible flow."*

* * *

Many of the obituaries and recollections I've read about Neil Armstrong emphasize that he was a modest man, which reminds me of the Winston Churchill quip at a memorial service for a deceased Member of Parliament. The eulogizer noted that the esteemed Member was a modest man, prompting Churchill to lean to a colleague beside him in the pew and whisper, "Yes, with much to be modest about." Armstrong, of course, had much *not* to be modest about. His modesty was a choice and a matter of temperament. But let's not make too much of his purported modesty, lest we confuse modesty for irresolution or hesitancy. Neil and his fellow astronauts were bold, decisive men. And those white-socks, pocket protector, nerdy engineers with whom Neil identifies? The kids who got teased in high school? The nation gave them $40 billion and told them to go out and beat the Russians. Go land a man on the moon, we said. And they did. Audacious!

See you next time.

Bill Murphy (505-845-0845, MS0165, wtmurph@sandia.gov)

Sound off, offer opinions…

Because it's time for another *Lab News/ Daily News* reader survey

The *Lab News/Daily News* readership survey Version 2012 is now open. Simply point a web browser to http://www.surveymonkey.com/s/XYT5B9J.

Completing the survey, which will remain open through September, will be easy since it is web-based with data collection and analysis by SurveyMonkey, the world's most popular online survey tool. And it won't take too much time — probably as little as five minutes or as much as 15 if comments are offered where invited.

The most recent survey of these two core internal Labs publications occurred in late 2009.

Retirees, too!

Dear Retiree Readers,

Thanks for your input last time, now you've got another chance . . .

More than 400 retired Sandians from around the country responded to a first-ever *Lab News* readership survey for retirees in 2009, so this important group is getting another chance to offer comments.

Retirees can access their survey by pointing their computer browser to http://www.surveymonkey.com/s/XWLCSBV. That site will be open through at least through the end of September.

However, we know there are retirees who don't use computers or who prefer paper. If you're in that group and you want to receive, complete, and return a printed survey, simply call 505-844-8009 or write to the Labs' Media Relations & Communications Dept., MS 0165, Sandia National Laboratories, Albuquerque, NM 87185-0165.

If you can't remember what it revealed or if you weren't at the Labs back then, coverage of the survey appeared in the Feb. 12, 2010, *Lab News* (http://www.sandia.gov/LabNews/ln02-12-10/labnews02-12-10.pdf).

Here are several of those results. Seventy-three percent of respondents classified the *Lab News* as "excellent" or "very good," while 4 percent thought it was "fair." Stories about technical accomplishments and initiatives topped the list of most-read items. Eighty-nine percent of respondents said they read at least half of each *Daily News* issue.

The survey also includes a section of questions about *Lab News Interactive* (https://info.sandia.gov/newscenter/interactive).

A similar readership survey designed for Labs retirees also is now available. (See Retirees, too!, above)

Among the various approaches SurveyMonkey employs to assure confidentiality are to disable storage of respondents' email addresses and to disable IP address collection.

As has been the case in all previous readership surveys, this year's version will ask for some Labs-specific demographic information such as years at the Labs, assigned division, and position classification, e.g., whether the respondent works in an administrative job or R&D.

A special email address — labnewssurvey@sandia.gov — has been set up to receive and respond to questions or comments.

Sandia LabNews

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LOCKHEED MARTIN

Sandia's OSU Recruiting Team wins Heart of Diversity Award

Sandia's Diversity & Inclusion Organization has recognized the Labs' recruiting team at Oklahoma State University with a Heart of Diversity Award.

The awards go to individuals or teams for recognizing, supporting, and taking action toward diversity and inclusion in the workplace.

"Addressing such difficult issues in a multidimensional workplace requires strong will and dedication," says Esther Hernandez (3010), senior manager for workforce diversity. "The Oklahoma State University Recruiting Team's dedication and vigor in seeking great minds with a particular focus on American Indians led to the nomination for The Heart of Diversity Award."

Sandia's American Indian Outreach Committee (AIOC), which nominated the team, says its efforts go beyond collecting résumés and interviewing. Partnering with AIOC, the team helps provide a welcoming, supportive, and inclusive environment for new hires. AIOC recruits American Indians from several universities but says the OSU team's efforts have resulted in an outstanding number of new hires and an increase in American Indian hires.

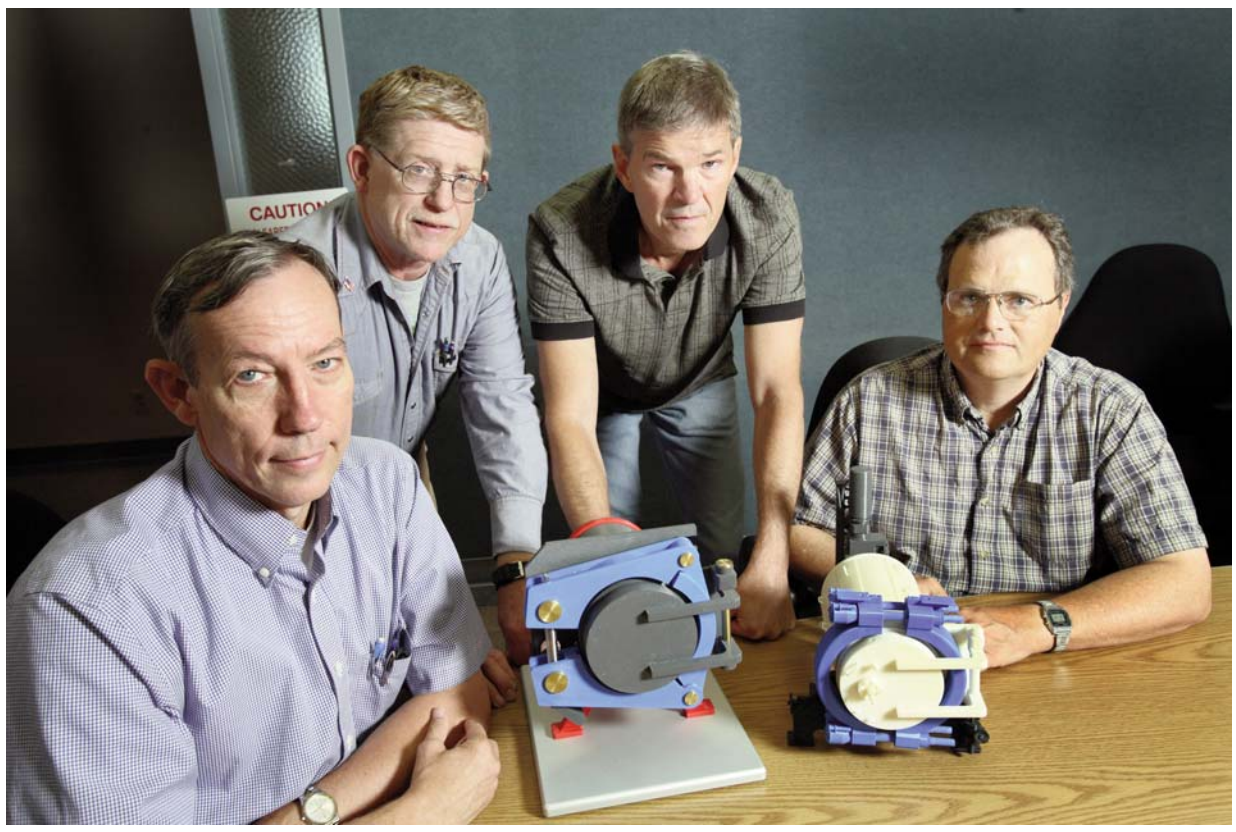
"The team members' passion is evident not only in the numerical results, but in the written commendation by new hires of the team's approach and help during and after recruitment," says Esther, adding that team members "are acting with diligence to focus on the American Indian population to discover exceptional individuals dedicated to providing exceptional service in the national interest."

The members are Greg Scharrer (0432), Jesus Ontiveros (10693), Louis Griego (10545), Nancy Clise (0853), Paul Graham (10501), Ken Holley (3555-3), Adrian Casias (1832), Melissa Herron (10667), and Phu "Bruce" Nguyen (10625).

"Inclusion is Sandia's choice, and it is an honor to recognize inclusive, respectful, and courageous behavior," Esther says. — *Sue Major Holmes*

Explosive Destruction System keeps pace with changing mission

By Patti Koning



THE EDS P2P TEAM of John Didlake, Don Golling (both 8123), Tom Raber (8131), and Bob Crocker (8125) with models of the P2P (left) and P2 (on right). Improvements to the P2P cut the processing time in half. (Photo by Dino Vournas)

The Explosive Destruction System (EDS), developed by Sandia for the US Army, is a modern technology that is being used to deal with remnants of our military history. Those remnants — in the form of recovered chemical munitions — continue to emerge in unusual places. Even though the battles of World War I and World War II were fought on foreign soil, munitions from those two wars continue to surface all over the country at current and formerly used defense sites and at burial sites.

EDS was developed in response to the need for a mobile system to safely destroy World War I-era chemical mortars and shells found in the Spring Valley neighborhood of Washington, D.C. The Spring Valley munitions were World War I artifacts, left behind when American University conducted chemical weapons research for the US Army.

EDS was first used in 2001 at Rocky Mountain Arsenal in Colorado and then at other locations including Spring Valley. Sandia next created a larger version of EDS, capable of destroying more munitions at once and handling munitions with a higher explosive charge.

Two of the larger systems were used from 2006 to 2010 to destroy more than 1,200 munitions, including 450 German Traktor rockets at the Army's Pine Bluff Arsenal in Arkansas (see the July 30, 2010 issue of *Sandia Lab News*). This enabled the Army to complete its mission to destroy all non-stockpile materiel declared when the United States entered into the 1993 Chemical Weapons Convention, an international treaty mandating the destruction of chemical warfare materiel.

Almost as soon as that mission was complete, Brent Haroldsen, John Didlake (both 8123), and other Sandia engineers went to work modifying the existing EDS design to increase speed. Called the Phase 2 Pilot, or P2P, this model incorporates several design changes that halved the processing time, from two days to one.

"When we first designed EDS, speed was not a priority," explains Brent. For the original application of safely destroying munitions in populated areas, the design emphasized transportability, flexibility, redundancy, certainty of destruction, and simplicity of manual operation.

Significantly reduced processing time

But the EDS process is not inherently slow. By changing the heating and cooling system and design of the door clamps, the researchers were able to significantly reduce processing time without sacrificing any of the attributes and strengths that have made EDS successful.

Now EDS may be used to clean up burial sites in places like Alaska's Fort Glenn, a World War II-era secret airfield that played a critical role in the Aleutian Islands Campaign. Records indicate that during the war munitions may have been buried there, but it isn't known if those munitions were ever recovered.

"A burial site remediation could take several years and in a remote place like Fort Glenn, the costs really add up," says Brent. "So if we can cut the processing time in half, that's a huge savings." Fort Glenn is just one of many suspected burial sites all over the country.

The core of EDS is a leak-tight vessel, in which munitions are placed. An explosive shaped charge opens the metal shell, exposing the chemical agent and burster, a small explosive that disperses the agent. The burster explodes or deflagrates safely inside the vessel. A reagent is then pumped into the chamber to neutralize the chemical agent. The chamber is heated and turned to mix the chemicals and facilitate the reaction.

Heating and cooling the vessel is the most time consuming part of the whole process. One of the biggest changes was a switch from heating the entire vessel from the outside in to pumping in steam to heat the vessel from the inside out. That reduced the heating time down from about 90 minutes to about 20 minutes, a total savings of more than two hours, since the vessel is heated in two stages.

MIXED UP — Mixing is one of the most important steps of the Explosive Destruction System process. The EDS P2P vessel shown here is rotating to promote mixing on tests of six 155 mm munitions with simulated agent.

"This was a significant change," says Brent. "Commercial steam fittings usually allow a little leakage, which is not acceptable for our process. And the whole vessel rotates as the steam is injected, adding another layer of complexity. It's more difficult to maintain the integrity of the seals with the big shifts in temperature that occur when the steam is turned on and off. So it took some time and work to develop fittings and valves that met our safety requirements."

"Not all of the safety issues were intuitively obvious," adds John. "The EDS is housed inside a vapor containment structure with a carbon filtration system that provides an extra layer of defense against an agent release. The filtration system does not like water, so we had to think about accident scenarios that might release steam into the building."

Cooling the vessel rapidly posed another problem. The vessel can't be opened until it has cooled to 60 degrees C, which used to take overnight. The researchers built an intermediate holding container, so the hot effluent can be drained as soon as the operation finishes. Cold water is then pumped into the vessel to accelerate cooling. Injecting steam actually made it easier to cool the vessel because the vessel walls don't get as hot.

Testing at Aberdeen Proving Grounds

The researchers also changed the clamps on the door of the vessel. In the Phase 1 and Phase 2 EDS, the clamp on the door was attached to the trailer when the vessel door was opened. "As you closed the door, you had to disconnect the clamp from the trailer to allow the vessel to rotate during operation," explains Brent. "The nuts on those clamps had to be tightened by hand."

The Phase 2 vessel is about 3 feet in diameter and the clamps weigh about 1,500 pounds each. Tightening the clamps required nearly an hour's worth of brute, physical work. The new design uses a clamp designed for undersea operations in the oil industry. Using a pneumatic wrench, the new door design can be closed in about five minutes.

Since February, the Army has been testing the P2P with live mustard agent at the Aberdeen Proving Ground in Maryland. The Sandia researchers are also working on additional modifications that will further reduce processing time and simplify the operation.

Before the vessel can be drained, liquid and gas samples must be collected and analyzed in a lab to confirm destruction of the agent. "We're working on gas and liquid monitoring systems based on MicroChemLab technology that will take regular samples throughout the process to give continuous feedback," says Brent. "Automating these two processes could save another two to three hours."

The P2P performed well in the Aberdeen Proving Grounds tests earlier this year. The Army is now considering if it is better to retrofit the existing EDS units or create a Phase 3 system. Brent expects work on either option to start sometime next year.

Sandia CaliforniaNews

Break-even

(Continued from page 1)

imploded by the huge magnetic field of Sandia's Z machine, the world's most powerful pulsed-power accelerator. Had they overly distorted, they would have proved themselves incapable of shoveling together nuclear fuel — deuterium and possibly tritium — to the point of fusing them. Sandia researchers expect to add deuterium fuel in experiments scheduled for 2013.

Consistent with earlier simulations

"The experimental results — the degree to which the imploding liner maintained its cylindrical integrity throughout its implosion — were consistent with results from earlier Sandia computer simulations," says lead researcher Ryan McBride (1648). "These predicted that MagLIF will exceed scientific break-even."

A simulation published in a 2010 *Physics of Plasmas* article by Sandia researcher Steve Slutz (1644) showed that a tube enclosing preheated deuterium and tritium, crushed by the large magnetic fields of the 25 million-ampere Z machine, would yield slightly more energy than is inserted into it.

A later simulation, published last January in PRL by Slutz and Roger Vesey (1644), showed that a more powerful accelerator generating 60 million amperes or more could reach "high-gain" fusion conditions, in which the fusion energy released greatly exceeds, by more than 1,000 times, the energy supplied to the fuel. (see https://share.sandia.gov/news/resources/news_releases/z-fusion-energy-output/).

These goals — both the near-term goal of scientific break-even on today's Z machine and the long-term goal of high-gain fusion on a future, more powerful machine — require the metallic liners to maintain sufficient cylindrical integrity while they implode.

The liner is intended to contain fusion fuel, like a can holds peanut butter, and push it together in nanoseconds like two semicylindrical shovels compacting snow together.

'The race is on'

An element of drama is present because the metallic liner doing the compressing also is being eaten away as it conducts the Z machine's enormous electrical current along its outer surface. This electrical current generates the corresponding magnetic field that crushes the liner, but under the stress of passing that current, the outer surface of the liner begins to vaporize and turn into plasma, in much the same way as a car fuse vaporizes when a short circuit sends too much current through it. As this happens, the surface begins to lose integrity and becomes unstable. This instability works its way inward, toward the liner's inner surface, throughout the course of the implosion.

"You might say: The race is on," says Ryan. "The question is, can we start off with a thick enough tube such that we can complete the implosion and burn the fusion fuel before the instability eats its way completely through the liner wall?

"A thicker tube would be more robust in standing up to this instability, but the implosion would be less efficient because Z would have to accelerate more liner mass. On the flip side, a thinner tube could be accelerated to a much higher implosion velocity, but then the instability would rip the liner to shreds and render it useless," he continues. "Our experiments were designed to test a sweet spot predicted by the simulations where a sufficiently robust liner could implode with a sufficiently high velocity."

By following the tiny dimensions proposed by the earlier simulations the physical test proved successful, and the liner walls maintained their integrity throughout the implosion.

Radiographs taken at nanosecond intervals depicted the implosion of the initially solid beryllium liner through to stagnation — the point at which an implosion stops because the liner material has reached the cylinder's central axis. The images show the outer surface of the imploding liner distorting until it resembles threads on a bolt. However, the more crucial inner surface remains reasonably intact all the way through to stagnation.

Says Ryan's manager Dan Sinars (1648), "When Magnetized Liner Inertial Fusion was first proposed, our biggest concern was whether the instabilities would disrupt the target before fusion reactions could occur. We had complex computer simulations that suggested things would be OK, but we were not confident in those predictions. Then Ryan did his experiments, using liners with the same dimensions as our simulations, and the outcomes matched. This achievement is an important milestone because we are now confident enough to take the next steps on the Z facility of integrating in the new magnetic field and laser preheat capabilities that will be required to test the full concept. Consequently, we have signed up to take those first integration steps in 2013. I'm very proud of Ryan and his team."

'One more step on a long path'

Slated for December are the first tests of the final two components of the MagLIF concept: laser preheating to put more energy into the fuel before magnetic compression begins, and the testing of two secondary electrical coils placed at the top and bottom of the can. Their magnetic fields are expected to keep charged particles from escaping the hot fuel horizontally. This is crucial because if too many particles escape, the fuel could cool to the point where fusion reactions cease.

Sandia researchers intend to test the fully integrated MagLIF concept by the close of 2013.

"This work is one more step on a long path to possible energy applications," says senior manager Mark Herrmann (1640).

The liner implosion experiments also served to verify that simulation tools like the popular LASNEX code are accurate within certain parameters, but may diverge when used beyond those limits — information of importance to other labs that use the same codes.

Ryan will give an invited talk on his work this fall at the American Physical Society's annual Division of Plasma Physics meeting in Providence, R.I. He is also preparing an invited paper for the journal P*hysics of Plasmas* to explain the PRL results in greater depth.

The work was funded by Sandia's Laboratory Directed Research and Development program and the National Nuclear Security Administration.

Assurance

(Continued from page 1)

help eliminate delays and difficulties during future investigations. And even more importantly, the information entered into AIS will provide Sandians with a more complete database that can be mined to analyze, detect, and mitigate problems, Labs-wide or locally, before they impact the mission.

The next release of AIS will allow Sandia to retire the Corrective Action Tracking System (CATS) and Laboratory Enterprise Self Assessment (LESA) tools. CATS and LESA tools will restrict new entries at the end of FY12, although the closure of existing records will continue through the end of the calendar year when any remaining open records will be transferred to AIS.

CATS and LESA, says Management System & Tools (754) manager Ed Weinbrecht, have been beset by usability problems and a lack of linkage and traceability to each other and other sources of data such as risk matters.

AIS will provide an integrated tool that allows organizations to document risks and associated mitigation activities, plan and track monitoring activities such as assessments or external evaluations, manage identified actions, and help transform assurance data into useful information for management review and decision making. The capability for integrating current AIS data with data from other tools and/or historical LESA and CATS data also will be available via a data warehouse that is easily searchable. AIS is transparent by design but has the ability to restrict individual record visibility. The AIS design philosophy was based on providing a system that can be used for tracking and learning and that supports Sandia's processes for managing risk.

"Assurance at Sandia is really a system of mindful behaviors, basic plan-do-check-act processes, and supporting tools. The Assurance Information System is one part of that system — an integrated tool that was designed by users with the user in mind," says Ed, one of several champions for the team that developed AIS over nearly two years. "It will make managing risk, conducting assessments, and implementing corrective actions much easier and the information will be much easier to access, use, and share Labs-wide."

Pat Smith, director of Mission Support and Corporate Governance (700), says the new AIS will help Sandia proactively and more efficiently manage its plan- do-check-act assurance processes.

"AIS is an important tool that will help us achieve assurance maturity, which is vital to realizing Sandia's Strategic Objective 3: Lead the complex as a model 21st century government-owned contractor-operated national laboratory," Pat says.

Pat says AIS will help Sandia provide more comprehensive, up-to-date knowledge toward ensuring problems and issues are identified and addressed; improve the accuracy, availability, reliability, and relevance of assurance information; and instill customer confidence that Sandia is a well-managed laboratory. In her role as Corporate Risk Officer, Pat also will be able to take advantage of AIS to monitor risks that are emerging or that cut across the Labs.

This month's rollout of AIS will be the second phase of its deployment. Phase one, the manage-risk module, was released in September 2011. AIS is Sandia's first in-house application that is leveraging a new Div. 9000 core competency in user experience design for more effective and efficient software applications. Therefore, AIS will benefit other Sandia application development projects in addition to providing the Labs with better assurance management.

Executive VP Kim Sawyer addresses Mission Support team at all-hands meeting

KIM SAWYER, DEPUTY LAB DIRECTOR and Executive VP for Mission Support, held an all-hands meeting August 30 for the approximately 2,750 people assigned to Mission Support organizations. Kim discussed a variety of topics, including achievements over the past year and current and future issues and challenges. Among the achievements she cited were the implementation of TotalComp, Sandia's redesigned external website and app, the initiation of LiveSafe safety-related information, energy-use reductions, cybersecurity improvements, development of a new cost-estimating tool, and implementation of the Assurance Information System to replace CATS and LESA. Current and future matters included the uncertain FY13 federal budget and its impact on Sandia; the new strategic Performance Evaluation Plan, which is more descriptive and less prescriptive in outlining annual goals for the Labs; the competition for the management and operating contract; and changes to performance and compensation. (Photo by Randy Montoya)

Sandia hand

(Continued from page 1)

with magnets and quickly plugged into the hand frame. The operator has the flexibility to quickly and easily attach additional fingers or other tools, such as flashlights, screwdrivers, or cameras. Modularity also gives the Sandia Hand a unique durability. The fingers are designed to fall off should the operator accidentally run the hand into a wall or another object.

"Rather than breaking the hand, this configuration allows the user to recover very quickly, and fingers can easily be put back in their sockets," Curt says. "In addition, if a finger pops off, the robot can actually pick it up with the remaining fingers, move into position and resocket the finger by itself."

Even easy for first-time users

The operator controls the robot with a glove, and the lifelike design allows even first-time users to manipulate the robot easily. The robot's tough outer skin covers a gel-like layer to mimic human tissue, giving the Sandia Hand the additional advantage of securely grabbing and manipulating objects, like a human hand.

Using Sandia's robotic hand to disable IEDs also might lead investigators to the bomb makers themselves. Often, bombs are disarmed simply by blowing them up. While effective, that destroys evidence and presents a challenge to investigators trying to catch the bomb maker. A robotic hand that can handle the delicate disarming operation while preserving the evidence could lead to more arrests and fewer bombs.

Sandia partnered with researchers at Stanford University to develop the hardware and worked with consulting firm LUNAR to drive costs down drastically. In current commercially available robotic hands, each independently actuated degree of freedom costs roughly $10,000.

"The Sandia Hand has 12 degrees of freedom, and is estimated to retail for about $800 per degree of freedom — $10,000 total — in low-volume production. This 90 percent cost reduction is really a breakthrough," says Curt. Additionally, because much of the technology resides in the individual finger modules, hands with custom numbers and arrangements of fingers will be quite affordable.

"At this price point, the Sandia Hand has the potential to be a disruptive technology," Philip says. "Computers, calculators, and cell phones became part of daily life and drastically changed how we do things when the price became affordable. This hand has the same potential, especially given that high-volume production can further reduce the cost."

DARPA is funding a separate software effort in a parallel track to the hardware work.

PRINCIPAL INVESTIGATOR Curt Salisbury (6533) developed an affordable robotic hand that is dexterous enough to mimic the capabilities of a human hand. (Photo by Randy Montoya)

Diversity

(Continued from page 1)

ESTHER HERNANDEZ, who heads Sandia's Diversity and Inclusion organization, is joined by Labs Director Paul Hommert, to her right, and Div. 4000 VP Mike Hazen, to her left, during a 2010 Veterans Day/Native American Heritage Month event at Hardin Field. (Photo by Randy Montoya)

Contributing to mission success

Esther helped start a conversation about a coordinated diversity strategy. "What do we want to do with this thing we call diversity and inclusion?" she says. "What does it look like?"

In alignment with Sandia's Strategic Objective 5 — Commit to a Learning, Inclusive, and Engaging Environment for our People — the EDC created a vision and definitions to set the effort's framework and focus. Diversity is the mix of differences and commonalities that each person brings to Sandia, and inclusion is the act of recognizing, accepting, and valuing the Labs' diversity for exceptional service in the national interest. The EDC vision is that Sandia will build and sustain a diverse workforce where all individuals know that they are important because they are valued, included, treated with respect and dignity, and are fully productive contributors to mission success.

"I really want people to enjoy coming to work, to be excited driving in in the morning and not feel weighed down," Becky says. "You shouldn't be stressed because you feel your voice isn't being heard or you don't feel an integral part of mission success. It should be part of your work life to be included and to recognize we're all diverse people, accept that diversity, and value it."

Other contributors to the diversity effort are the Military Support, American Indian Outreach, Asian Leadership and Outreach, Black Leadership, Disabilities Awareness, and Hispanic Leadership and Outreach committees; the Sandia Women's Action Network (SWAN) in New Mexico and Sandia Women's Connection in California; Wounded Warrior Program; Christians in the Workplace Networking Group; and the Gay, Lesbian, Bisexual, Transgender Networking Group.

Esther meets with the diversity councils and with outreach groups to collaborate, coordinate, and keep a diversity dialogue going. She works to leverage outreach efforts in recruiting, engagement, retention, and building a welcoming environment for new hires.

"I look at what everybody is doing and make sure we're all headed in the same direction," Esther says. "We try to leverage the best practices of each group."

Among the efforts are the https://sharepoint.sandia.gov/sites/Diversity/SitePages/DIO-homepage.aspx website offering toolkits such as the Workshop in a Box to facilitate diversity discussions; a monthly Diversity Cinema featuring movies and talk about such topics as weight, sexuality, and race; and a variety of outreach events such as a recent SWAN workshop on gender in the workplace.

Another significant effort is the Effective Leadership of Inclusive Teams (ELOIT) training that started with Sandia's executives and is filtering through the management ranks. All executives will have gone through the seven-day course by the end of December. An ELOIT alumni team has formed to leverage the training and help spread the word.

"Many of our executives are taking the training and doing something with it," Becky says. "Some divisions are holding diversity dialogues and coming up with mechanisms such as workshops to move it through their organizations. The next step is taking awareness and turning it into behaving differently."

A business case for diversity

Becky says diversity in the workplace pays off for individuals and the mission. Employees who feel respected, valued, and included are more engaged and productive, she says, and a diverse workforce brings more ideas to the table.

"We give better service and products to the nation if we bring in and hear those voices," she says. "That's the business case for diversity."

Sandia VP Rick Stulen and Principal Staff Director David Williams of the Office of the Lab Director & President Org. 100 took the two-part ELOIT training separately around the time it was launched two years ago. The first class is also known as the white male caucus and that's what Rick and David found when they walked in — a room full of white men.

They were asked to explore what it means to be a white male in the US workplace. "It was a huge eye-opener," David says. "I learned two key things. First is that our culture makes it very easy to be a white male. There are many, many privileges. And second, the price we pay for white male privilege is that we don't bond together as a culture. We're Lone Ranger guys. We're the fixers. We're not taught to express feelings."

Rick says the class helped the men understand the dominant white-male culture. "We're often not aware of it because we're swimming in our own water," he says.

'Do you see my color?'

The men talked, learned, and bonded. "It was safe to be vulnerable and help each other," David says. Rick says he saw in a new light "the broad set of issues around the Sandia workplace and the white-male culture and how it impacts everything we do from hiring to staffing projects to promotions."

The second piece of ELOIT is Allies, a course that brings the men together with women and people of color. "We created a safe working environment and engaged in conversations around issues that aren't normally safe to talk about," David says. "The white men were asked by the people of color, 'Do you see my color?' That led to profoundly deep conversations."

He says he grew closer to women, people of color, and his fellow white men. "As we went through these experiences we became less judgmental and leaned into our individual discomfort to learn from one another," he says. "I developed a genuine regard for the well-being of others, a genuine valuing of another person for what they have to add to my experience and to our collective experience."

David says the bottom line is that diversity is a given. It exists. Inclusion is the purposeful act of extracting value from that diversity.

"We made the decision to be inclusive," he says. "Inclusion is making that leap to embrace the diversity for a common good. I now have a deeper level of support and fellowship with white males than before. I now share that with white women and people of color. This is a journey. It's a gift to this lab."

Ultimately, Esther and Becky want diversity and inclusion to become an intrinsic part of the Sandia culture. "It will be part of the way we operate," Esther says. "We won't even think of it as diversity and inclusion. It will just be the way we do business."

Esther's office, the EDC, CDT, and outreach groups will continue to promote diversity and inclusion in ways that reach people throughout the Labs.

"We have a committed set of people working to make Sandia an inclusive place to work. We want people to watch for it and participate. It's mission imperative for us to pay attention to this," Becky says. "And it's the right thing to do."

Diversity Action Plan

- Develop an inclusive work environment
- Link the diversity initiatives to mission results and impact
- Enable a culture of inclusion that attracts and retains a diverse workforce
- Develop the diversity and inclusion awareness and skills of Sandia leadership

Memories: Sandia studies the corners of the mind

By Sue Major Holmes

It looks bizarre — a woman filling out paperwork at a desk while Sandia researcher Laura Matzen and University of New Mexico graduate student Mike Trumbo poke plastic syringes and narrow wooden sticks into what looks like a button-covered swim cap on her head.

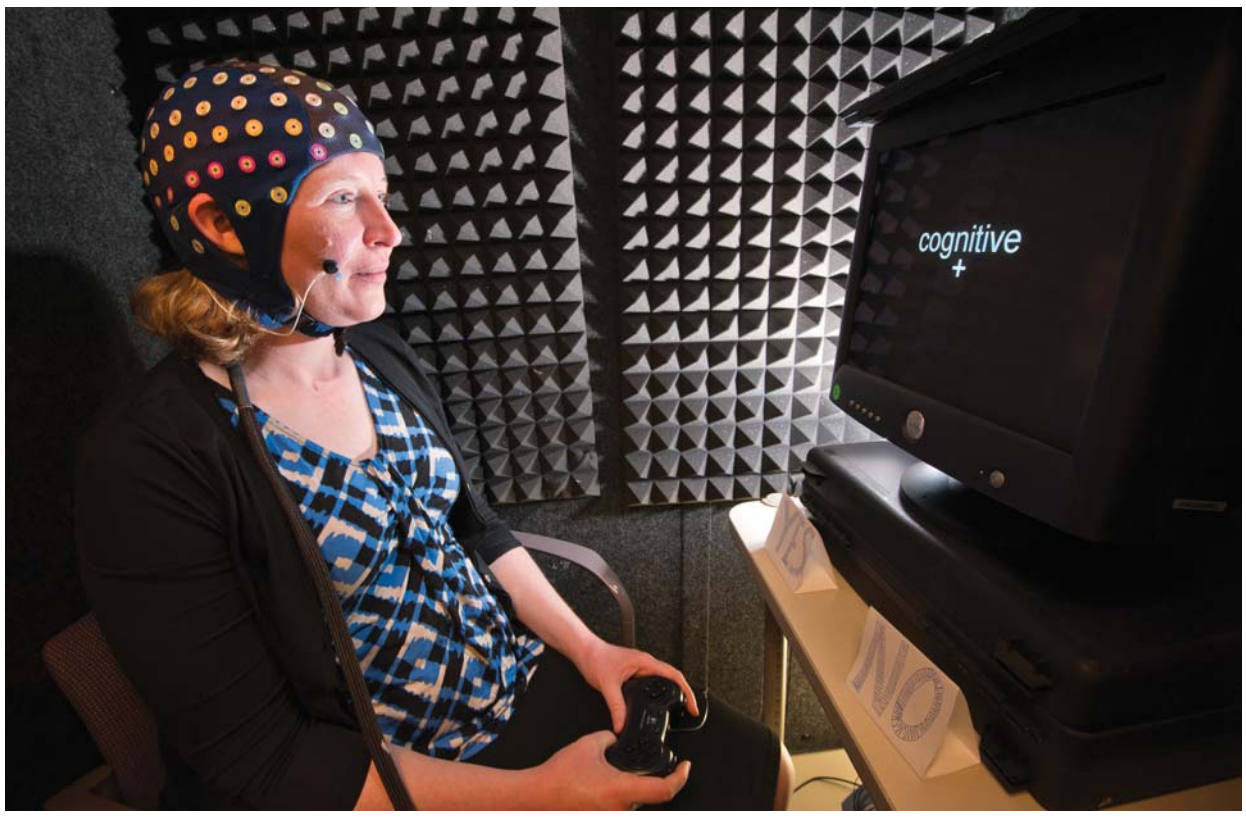
Laura (1463) and Mike (1462) were preparing a volunteer in the final year of a three-year Laboratory Directed Research and Development (LDRD) study into whether signals from the brain can predict whether people will remember something and whether training helps them remember.

The cap's buttons are electroencephalography (EEG) sensors, each with a small hole through which Laura and Mike inject a hair-gel-like substance containing electrolytes to help pick up the brain's electrical signals. Across the room a computer screen shows dots corresponding to each sensor. As Laura and Mike inject gel, the dots slowly turn from red to yellow to blue, indicating good contact as the gel penetrates. When it doesn't penetrate enough, they poke sticks through the holes to spread it.

Sandia's Human Studies Board reviewed and approved Laura's experiment.

The study is part of Laura's long-term goal to understand the Difference Related to Subsequent Memory, or Dm Effect, an index of brain activity encoding that distinguishes subsequently remembered from subsequently forgotten items. The measurable difference gives cognitive neuroscientists a way to test hypotheses about how information is encoded in memory.

Laura is interested in what causes the effect and what can change it. She hopes her research eventually leads to improvements in how students learn. She'd like to discover how training helps people performing at different levels and whether particular training works better for certain groups.



MONITORED by electroencephalography (EEG) sensors, researcher Laura Matzen (1463) sits in a soundproof booth watching a screen that flashes words or images for one second. Laura has been studying whether signals from the brain can predict whether people will remember something and whether training helps them remember. (Photo by Randy Montoya)

Two-part study

Her study had two parts: predicting how well someone will remember what's studied and predicting who will benefit most from memory training.

No one had tried looking at brain activity while people studied to predict how they'd do, Laura says.

"We're the first to show that's possible. We've replicated that several times on different tasks, so it seems like it's robust," she says.

COGNITIVE RESEARCHER Laura Matzen (1463) uses Susan Stevens-Adams (6231) to demonstrate how she readies volunteers with electroencephalography (EEG) sensors as part of a study into memory and memory training. She injects gel through holes in the cap's sensors to make sure they have good contact for the EEG. (Photo by Randy Montoya)

For example, "if you had someone learning new material and you were recording the EEG, you might be able to tell them, 'You're going to forget this, you should study this again,' or tell them, 'OK, you got it, and go on to the next thing,'" Laura says.

She presented the results in April at the Cognitive Neuroscience Society conference in Chicago.

Her team monitored test subjects' brain activity while they studied word lists, then used the EEG to predict who would remember the most information. Because researchers knew the average percentage of correct answers under various conditions, they had a baseline of what brain activity looked like for good and poor memory performance. The computer model predicted five of 23 people tested would perform best. The model was correct: They remembered 72 percent of the words on average, compared to 45 percent for everyone else.

The second part of the project tested different types of memory training to see how they changed participants' memory performance and brain activity. One of Laura's goals is to find out whether recording a person's brain activity while they use their natural approach to studying can predict what kind of training would work best for that person.

Analyzing the findings

Laura is still analyzing those findings, but says she's encouraged by preliminary results. The computer model from the earlier studies was used to predict who would perform best on the memory tasks, and the high performers did even better after memory training.

"That's promising because one of the things we want to do is see if we can use the brain activity to predict how people react to the training, whether it will be effective for them," Laura says.

She presented preliminary findings this summer to the Cognitive Science and Technology External Advisory Board, made up of representatives of universities, industry, and laboratories who advise the investment area team managing the LDRD portfolio. Laura is working on a technical paper to submit this fall to a psychology journal. She'd also like to follow up with more concrete tasks.

"Right now it's very abstract kind of memory, memorizing word lists," she says. "I think the next step would be to use more real-world memory working tasks, such as what military personnel would have to learn as new recruits, and see if the same patterns apply to more complex types of learning."

Sandia's cognitive systems group, where Laura works, often does Work for Others, including the military. The US Navy in particular is investing in research on training and performance, looking for ways to save money by helping people learn better or faster, Laura says.

For the study of memory training techniques, about 90 volunteers spent nine to 16 hours over five weeks doing memory tests. Their first session developed a baseline for how well they remembered words or images. Most then underwent memory training for three weeks and were retested.

A control group received no training. A second group practiced mental imagery strategy, thinking up vivid images to remember words and pictures. The final group went through "working memory" training to increase how much information they could handle at a time. Laura says that averages about seven items, such as digits in a phone number.

Each volunteer, shut into a sound-proof booth, watched a screen that flashed words or images for one second, interrupted with periodic quizzes on how well the person remembered what was shown.

Designed to be difficult

"It's designed to be really difficult because we want lots of room to improve after memory training," says Laura. The test was divided into five sections, each about 20 minutes long followed by a break to keep volunteers alert. Each section tested a different type of memory. The first, middle, and last sections consisted of single nouns. During quizzes, volunteers hit buttons for yes or no, indicating whether they'd seen the word before.

The other two sections combined adjectives and nouns or pairs of unrelated drawings, with volunteers again being tested on what they remembered. The image section tested associative memory — memory for two unrelated things. Laura says that's the most difficult because it links arbitrary relationships.

When the performance of the groups was compared before and after training, the control group did not change, but the mental imagery group's performance improved on three of the five tasks.

"Imagery is a really powerful strategy for grouping things and making them more memorable," Laura says.

The working memory group did worse on four of the five tasks after training.

Volunteers trained on working memory — remembering information for brief periods — improved on the task they'd trained on, but training did not carry over to other tasks, Laura says.

She believes it boils down to strategy. The imagery training group learned a strategy, while working memory training simply tried to push the limits of memory capacity.

"I think that's why they did worse; they aren't using an appropriate strategy for these other tasks," she says.

While the imagery group did better overall, they made more mistakes than the other groups when they were tested on "lures" that were similar to items they had memorized.

"They study things like 'strong adhesive' and 'secret password,' and then I might test them on 'strong password,' which they didn't see, but they saw both parts of it," Laura says. "The people who have done the imagery training make many more mistakes on the recombinations that keep the same concept. If something kind of fits with their mental image they'll say yes to it even if it's not quite what they saw before."

The Center for the Advanced Study of Language at the University of Maryland provided the working memory materials but had no financial involvement in the study Laura designed. Now she and the center are working on a funding proposal to study tasks that measure cognitive flexibility and how that relates to training performance.

Because the results of the study seem to show that strategy is really important, "we want to dig into that more and see if these measures of cognitive control relate to who can best use the strategy or switch between different strategies for different tasks," Laura says.

Student MEMS contest winners painlessly measure knee joint fluids, quickly characterize adsorbed material

By Neal Singer

The annual Sandia-hosted competition for the design of new, extraordinarily tiny devices this year attracted engineering students from nine universities, almost double the number competing in 2011.

Texas Tech University was again triumphant in the "novel design" category of the microelectromechanical (MEMS) device contest, while Carnegie Mellon University (CMU) students again led the way with their second "educational MEMS" prize in two years.

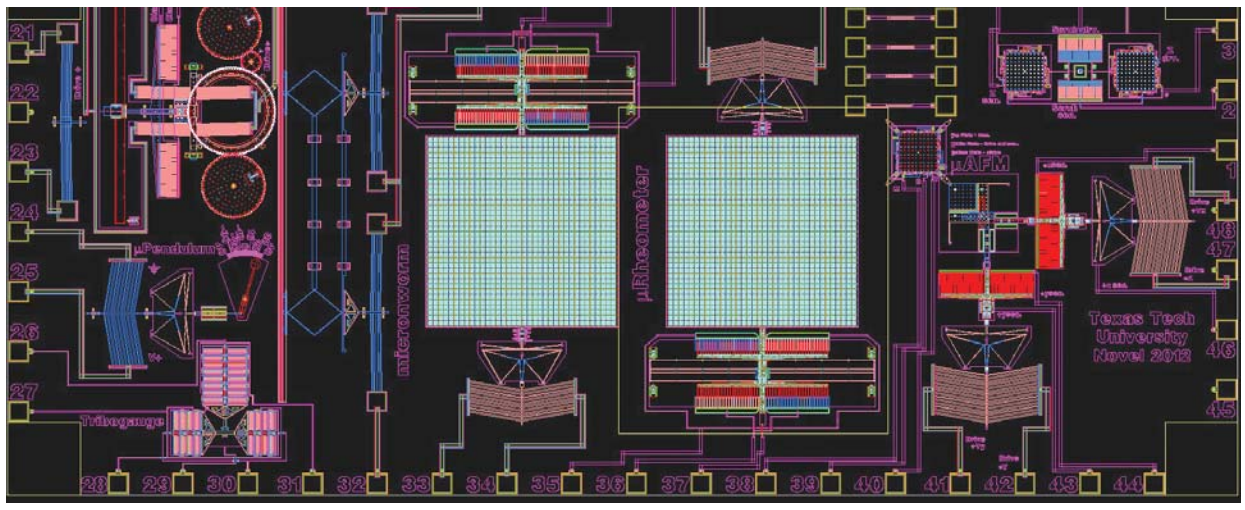
Student designs are blueprints for the construction of mechanical devices in the micrometer size range, to be powered by tiny amounts of electricity. MEMS devices already are omnipresent in modern society. They help inkjet printers and laser disk players to function, probe biological cells, operate high-tech machinery, route telecommunications, and much more. Uses for the devices — inexpensive to construct and costing little to operate — continue to (metaphorically speaking) fall out of the sky. Some devices are smaller than the thickness of a human hair (about 70 micrometers).

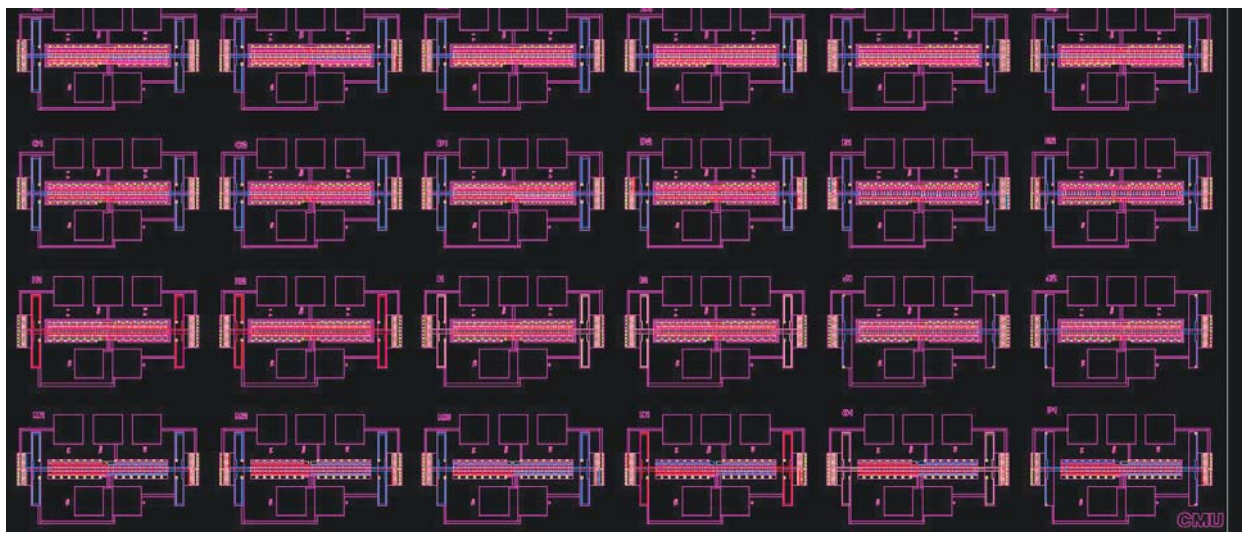
Projects designed on SUMMiT V™

Texas Tech students, who last year won with an ingenious, dust-sized dragonfly with surveillance possibilities, this year designed a micro-rheometer device able to measure the behavior of very thin quantities of liquid, like the synovial fluid found in knee joints. The method requires very small samples compared to macro-scale rheometers, the current standard tool. "It is much easier, and usually less painful, to obtain small quantities of bodily fluids from patients," the students wrote in their project description. The project used an advanced design process called SUMMiT V™, created and supported by Sandia. The process allows five separate layers of silicon to be put together to form a complicated device.

Carnegie Mellon students, who last year designed a highly sensitive microvalve for more control over very small fluid flows, this year made use of the relatively large change in mass that occurs when a microdevice adsorbs even a small amount of material. The increase significantly alters any vibrational frequencies of the system. Characterizing adsorbed material by this mechanism can say a lot very quickly about surface changes to be expected in the structure under observation. Water vapor on MEMS devices may reduce the fatigue strength of polysilicon MEMS, while hydrocarbons adsorbed onto microrelay contacts increase their electrical resistance.

Sandia engineers review student designs. Travel by students and professors to the awards ceremony was made possible by grants from SPIE (the International Society for Optics and Photonics). Carnegie Mellon professorial oversight was provided by Maarten de Boer. Texas Tech students were supervised by TTU faculty advisor Tim Dallas.





THE TWO WINNING STUDENT MEMS DESIGNS — The Texas Tech design, top, proposes to create a micro-rheometer to measure very thin quantities of liquid, like that found in knee joints, while the Carnegie Mellon device (bottom image) offers students ways to quickly characterize material adsorbed by a microdevice while the amount is still very tiny.

The contest, called the University Alliance Design Competition, now includes Mexican as well as US universities. Sandia executives led by Div. 1000 VP Steve Rottler and Gil Herrera, director of Microsystems Science, Technology and Components Center 1700, helped encourage participation by traveling to Mexico to sign memorandums of understanding to promote MEMS science and technology there.

Competing schools this year included the Air Force Institute of Technology, Arizona State University, Central New Mexico Community College, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV), Carnegie Mellon University, Southwestern Indian Polytechnic Institute, Texas Tech University, Universidad de Autonoma de Ciudad Juarez, Universidad de Guadalajara, Universidad de Guanajuato, University of Oklahoma, University of Utah, and Universidad Veracruzana.

The MEMS University Alliance is part of Sandia's outreach to universities to improve engineering education. It is open to any US institution of higher learning and select Mexican universities.

Alliance has more than 20 members

The alliance provides classroom teaching materials and licenses for Sandia's special SUMMiT V™ design tools at a reasonable cost, so universities that lack fabrication facilities can develop a curriculum in MEMS. The design competition is growing within the University Alliance, which now has more than 20 members.

The entire contest process takes almost nine months. It starts with students developing ideas for a device, followed by creation of an accurate computer model of a design that might work, analysis of the design, and, finally, design submission. Sandia's MEMS experts and university professors review the design and determine the winners.

Sandia's state-of-the-art MESA fabrication facility then creates parts for each of the entrants. The design competition capitalizes on Sandia's confidence in achieving first-pass fabrication success, which restricts the entire process to a reasonable student time frame.

Fabricated parts are shipped back to the university students for lengthy tests to determine whether the final product matches the purpose of the original computer simulation.

The University Alliance coordinates with the Sandia-led National Institute for Nano Engineering (NINE), providing additional opportunities for students to self-direct their engineering education, and the Sandia/Los Alamos Center for Integrated Nanotechnologies (CINT), a DOE Office of Science center with the most up-to-date nanotechnology tools.

The student presentations were hosted by Keith Ortiz, manager of MEMS Technologies Dept. 1719.

For more information regarding the University Alliance and the design competition, contact Stephanie Johnson at srjohns@sandia.gov.

NNSA Deputy Administrator, former Sandian Don Cook congratulates Weapon Intern Program graduates

NNSA DEPUTY ADMINISTRATOR for Defense Programs Don Cook addresses the 2012 Sandia Weapon Intern Program graduating class during ceremonies last week at the Steve Schiff Auditorium. This year's class, the 14th graduating class since the program's inception in 1998, included nine Sandians, three officers from the Air Force Fellows Program, two participants from the Air Force Nuclear Weapon Center, three from the Kansas City Plant, two from the Pantex Plant, and one each from Los Alamos National Laboratory, Y-12, NNSA, and Savannah River Site. These graduates join an alumni group that now consists of 289 graduates. Cook gave a brief history of the nuclear weapon enterprise, pointing out the environment that existed during the development of "their grandfather's stockpile." He told the graduates that today's environment is much different and that they have a daunting task because the nuclear weapon stockpile they work on will be inherited by their great-grandchildren.
(Photo by Randy Montoya)

Body conscious

Website aims to keep you on your feet, out of the ER

By Nancy Salem

Here's a real Sandia story. In a hurry to get home, Phil grabbed his lunch box, water bottle, and sunglasses and headed down a flight of stairs. The next thing he knew he was in a heap on the landing with a broken leg.

Phil (not his real name) is an all-too-common statistic, someone who didn't have to get hurt, but did. In Phil's case, chances are he wasn't holding the handrail or watching his step.

"It's a major problem," says Karen Armstrong (4130). "We have a tendency at Sandia to have lots of slips, trips, and falls. People don't always pay attention to where they are and what they're doing. Some falls can change your life, and they are so preventable."

Karen is on a team that was asked last October by Sid Gutierrez, director of Radiation Protection, Waste Management and ES&H Org. 4100, to find a way to reduce accidents in general, and slips, trips, and falls in particular.

They came up with LiveSafe, an internal website (https://info.sandia.gov/esh/ livesafe/index.php) focused on safety at work and at home.

"We start with what LiveSafe isn't," says team member Michael Townsend (4130). "It's not a campaign. It's not a slogan. It's not a set of rules and regulations. It's not about numbers. LiveSafe is a way of life."

He says LiveSafe is being aware of potential accidents and injuries and acting in a way that minimizes your risk. "Knowing that a particular action often leads to an injury raises your ability to avoid the injury," he says. "Being aware of activities that have a higher accident rate gives you a chance to lower the odds."

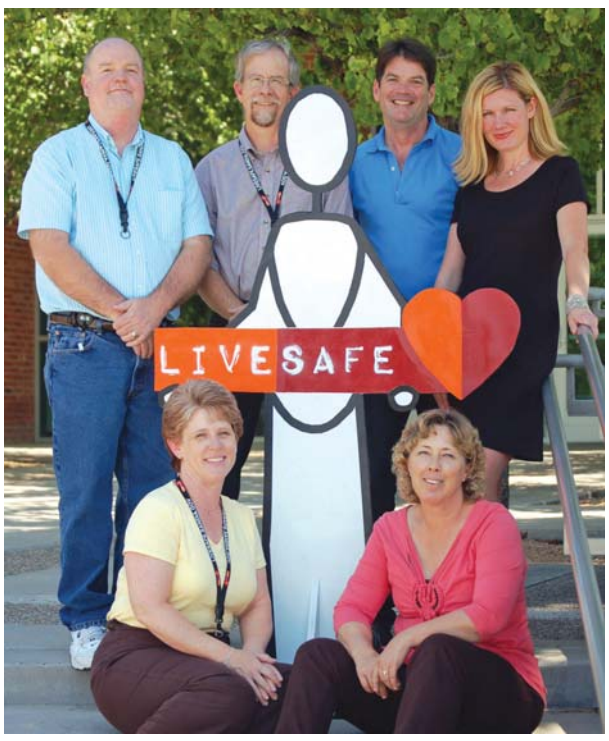
An interactive place

LiveSafe is no ordinary website, Karen says, the kind you hear about, visit once then promptly forget. "We don't want it to be a flash in the pan or flavor of the month," she says. "We want it to be constantly changing and never stale."

The site, launched in April, is an interactive place where Sandians can share information, stories, and tips — on the record or anonymously. "Visitors are invited to be contributors. We want it to be a community," Michael says. "We don't want to lecture or talk to the people, but with the people. It's a way for us to help each other be safe, to watch out for ourselves and those around us with the expectation of everyone going home safely."

The site is built around a resource library with a vast databank of photos, videos, scenarios, publications, and tools addressing the most common injuries: slips, trips, and falls; struck by/against; overexertion; ergonomics; and traffic. The articles focus on dozens of topics from office hazards to being safe in wind to staying awake while driving. Photos illustrate a startling array of bad decisions.

"I love it. My measure of success is that people use it, everyone from staff to VPs," says Sid. "A key purpose is to give level-one managers a starting place for critical discussions with staff about safety. The videos, pictures, and scenarios can inspire discussion. We want to get a conversation going. Then you have a learning environment going on."



THE LIVESAFE WEBSITE TEAM from Org. 4100, (clockwise from top left) Ben St. Clair, Fran Nimick, Michael Townsend, Katrina Wagner, Lynda Innis, and Karen Armstrong, surround a life-size model of their mascot, Pat. "We enjoy what we do and love working together," Karen says. "This project has been great in every way." (Photo by Nancy Salem)

Where's Pat?

LiveSafe has pages where people can share safety stories, discuss scenarios, build a custom screen saver, read safety news, and enter a monthly photo caption contest. "We'll keep adding things, changing things, so people will wonder what we're up to each week and come back to see what's there," Karen says.

Ultimately, the goal is to raise awareness. "We want to change the perception. What does it really mean to be safe? What is it aside from regulations?" says team member Lynda Innis (4130). "It's about being safe in general. Not just here at work. Safety comes from within. We want to get to the heart of why you want to be safe."

LiveSafe's mascot is Pat, a lively stick figure who illustrates the right and wrong way to do things. Pat, Michael's creation, can be found throughout the site in all the accident categories, as well as in LiveSafe promotional materials. And a large, real Pat was built to further bring the LiveSafe concept to life.

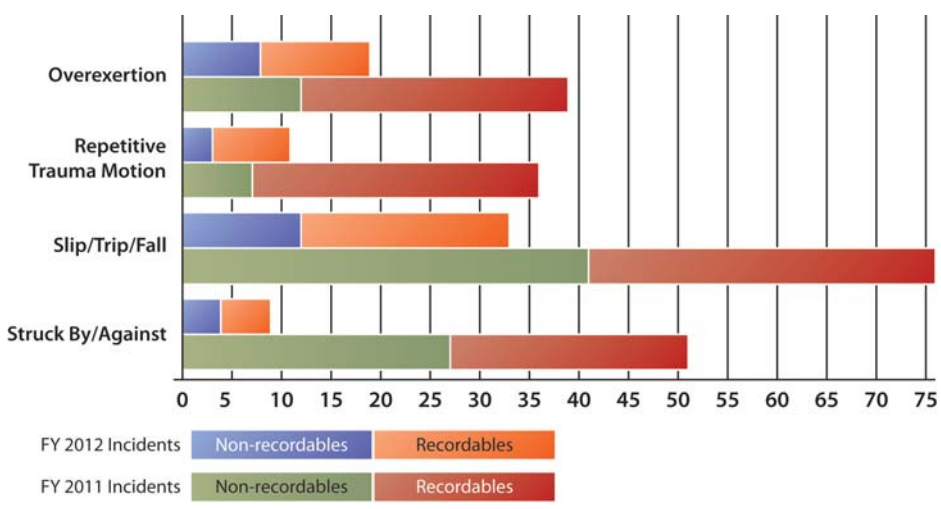
Visits to the site have numbered from 1,500 to 2,000 a month. Diana Perea (5562) has clicked through LiveSafe and won the inaugural June caption contest for a photo you have to see to believe, https://info.sandia.gov/esh/livesafe/images/contests/contest-1.png. "I really like the site," Diana says. "It's easy access and has lots of information. It is information we need. Since reading LiveSafe, I'm definitely more alert, especially when I'm walking. I don't take shortcuts across landscaping. I hold the stair handrails, and I watch my feet. It's a positive thing."

Diana says she goes back to the site to see what's new. "Safety can sometimes be kind of boring," she says. "LiveSafe makes it interesting."

LiveSafe is not a short-term effort, but will continue to grow and evolve with input from the Sandia community. And while the LiveSafe team, rounded out by Fran Nimick (4130), Ben St. Clair (4130), and Katrina Wagner (4143), hopes its work will reduce accidents, it probably won't totally run out of stories to tell.

"Without your thoughts and content it will be an empty site," Michael says. "We're counting on Sandians to bring it to life."

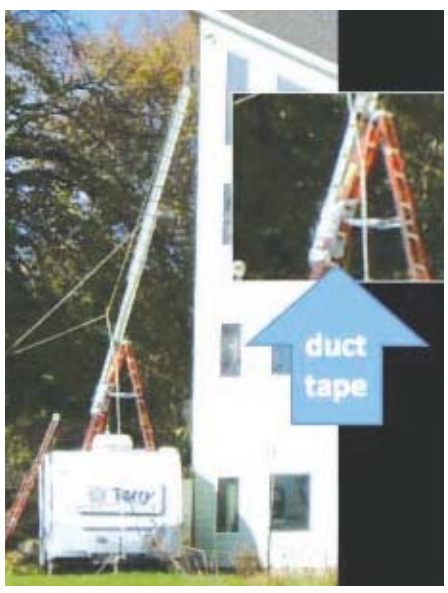
Corporate incident rate, by cause



Slips, trips, and falls are the most common accidents at Sandia, resulting in 78 injuries in 2011 and the same number of lost work days. The LiveSafe website offers the following ways to stay on your feet:

- Be aware
- Keep eyes on the path
- Stay on designated walkways
- Don't get distracted
- Walk slowly on slippery or slick surfaces
- Maintain your line of sight when carrying items
- Wear low-heel, non-skid footwear

Epic safety fails . . . don't try these at home



2013 Truman Fellows blazing new trails in their fields

Proposed research will advance Labs' capabilities in plasma research, bionanotechnology

By Bill Murphy

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

Researchers Christina Ting and Paul Schmit have been selected as Sandia's 2013 Truman Fellows. They join the ranks of 17 other Fellows who have been appointed since the President Harry S. Truman Fellowship in National Security Science and Engineering was established in 2004. Because the fellowships are three-year assignments, five Truman Fellows are still doing research at Sandia. Additionally, eight other Truman Fellows subsequently joined the Labs' technical staff upon completion of their fellowship assignments, five of whom are still researchers at Sandia.

CHRISTINA TING

Christina, who recently earned her doctorate in biochemistry and molecular biophysics from Caltech, will be working in Computational Materials Science and Engineering Dept. 1814. Her manager will be Amy Sun and her mentor is Amalie Frischknecht. Paul, who earned his doctorate in plasma physics from Princeton University this year, will be working in ICF Target Design Dept. 1644. His manager, Charlie Nakhleh, will also be his mentor. Both Christina and Paul are scheduled to begin their Truman fellowships in November.

Sandia Chief Technology Officer and Div. 1000 VP Steve Rottler says that with its remarkable track record of attracting top-tier talent to Sandia, the Truman Program is more vital than ever.

"This year," Steve says, "two Truman Fellow program developments are especially noteworthy: Sandia received the most applications from qualified individuals it has ever received, and a current Campus Executive Graduate Research Fellow [Christina Ting] was chosen Truman Fellow. Those elements made the Truman selection committee's job in down-selecting outstanding research proposals even more challenging.

"Also noteworthy is the fact that this will be the first time a Truman Fellow has been placed in Division 1600 — the Pulsed Power Sciences Center, signifying the growing breadth of the program and applicant pool. The two individuals offered the Fellowship, Paul Schmit and Christina Ting, had outstanding proposals and we look forward to great research from them."

Christina, a native of the Houston area, did her undergraduate work at the University of Texas at Austin, where she earned a BS in biochemistry. Her doctoral dissertation at Caltech was titled "Minimum Energy Paths and Nucleation Events in Lipid Membranes." Christina has been lead author on a number of technical papers and has done several presentations on her work. Among her numerous awards, she is the recipient of a $60,000 Sandia Campus Executive graduate research project, which she completed during 2011-2012.

PAUL SCHMIT

Paul earned a bachelor of science degree in physics from the University of Arizona before moving on to Princeton for his graduate studies, which he completed this year. His doctoral dissertation was titled "Wave Particle Interactions in Nonstationary Plasma." Paul has been lead author on several peer-reviewed papers on his thesis work and has presented his findings at numerous conferences and symposiums. Among his various awards, Paul has been the recipient of fellowship grants from both DOE and DoD.

The Truman Fellowship selection committee found much to praise in the research proposals by Christina and Paul.

Regarding Christina's work, the committee wrote, "Christina Ting's research focuses on developing simplified models of the complex biological problem of nucleation of rupture events in membranes. This work has significant implications in the area of drug delivery, virus attack of cells, and nanoparticle incorporation into cells and should have a widespread value in understanding artificial soft materials. . . . Successful results could form the basis for a strong proposal for NIH funding and also strengthen Sandia's reputation in computational biology applied to biodefense problems important to national security."

In his doctoral research, the committee noted, Paul "has uncovered striking new phenomena in plasma physics that have broad and potentially profound implications for inertial confined fusion systems. . . . One of his most important findings is a switch-like conversion of plasma wave energy into plasma thermal energy at selected locations of the particle energy distribution in the compressing plasma. . . . Paul has identified a clear course of research to continue and expand on the groundbreaking developments within his thesis work. His proposed 2D/3D/magnetic PIC code development project is very ambitious and would undoubtedly mark a very notable advance."

"WHEN I'M NOT WORKING, you'll find me on my bicycle," says Christina Ting, seen here on a ride last April at Palomar, near San Diego.

* * *

The *Lab News* recently asked Christina and Paul to describe the work they intend to pursue at Sandia. Here's what they had to say:

Christina Ting — "The interaction of nanoscale objects with lipid membranes is a common theme underlying a number of important phenomena in bionanotechnology, ranging from pathogen invasion to nanoparticle cytotoxicity to the delivery of medical therapeutics. Importantly, membranes are soft matter systems comprised of lipids that self-assemble into fluid bilayers. As such, thermal fluctuations are important and many interesting membrane processes involve thermally nucleated events. Besides the long time scales associated with nucleated (rare) events, a significant challenge arises because of the high dimensional free energy surface due to the complex molecules comprising the membranes. Hence, with any sizable nucleation barrier, direct computer simulation is unfeasible.

"At Sandia, I hope to contribute to our understanding of the fundamental physics of nucleated pathways in membranes. Specifically, using a novel method developed in my graduate work, I will explore a wide range of challenging and previously intractable membrane nucleation problems involving nanoscale objects. The molecular insights provided by these studies will enable the rational design of innovative medical therapeutics such as gene/drug delivery systems, antivirals, and antimicrobial peptides. Beyond the biosciences, the method paves the way for studying a wide range of nucleation phenomena in, for example, polymer-nanoparticle composites, where applications range from optics to sensors to catalytic devices.

The Truman Fellowship, with its access to Sandia's world-class scientists, research facilities, and computing resources, is the ideal platform from which to begin an independent research career toward achieving these goals."

* * *

Paul Schmit —"The cornerstone of plasma physics research is the quest for controlled thermonuclear fusion energy: ideally, a collection of hydrogen gas so hot and dense that its ionized constituents undergo nuclear fusion, releasing more energy than was required to heat and compress the gas in the first place. The achievement of nuclear fusion break-even will be a major cause for optimism regarding the sustainability of our energy-hungry civilization while, historically, the mission itself has yielded an almost unlimited number of challenging problems to solve and a host of technological breakthroughs. Besides its role in fusion, plasma is a veritable workhorse, being used to propel spacecraft to other planets, hot rod and miniaturize charged particle accelerators, and streamline the manufacture of the critical semiconductor technologies that enable our modern lifestyle.

"At Sandia, my research will seek to uncover new and potentially useful phenomena associated with one of the universal aspects of plasma behavior: waves. Through various electromagnetic and acoustic interactions, plasmas support a whole zoo of different waves. In fusion, waves have been deployed to heat the fuel, drive electrical current, and extract exhaust byproducts. My own doctoral research has focused on waves in plasmas undergoing compression and expansion. It has uncovered a novel switch-like mechanism to deliver bursts of heat, current, and/or voltage to plasma, a better understanding of how waves affect plasma compressibility, and a method to enhance the performance of plasma-based particle accelerators.

"Sandia's celebrated Z Facility, one of the world's most sophisticated plasma compression experiments, will provide the means and the context to extend this research into entirely new territory, where novel wave effects could potentially make cutting-edge methods to achieve fusion easier to realize. The mentorship of world-renowned physicists in many fields, access to unparalleled supercomputing power, and the independence provided by the Truman Fellowship all make Sandia a wonderful community to join and an incredible place to propel my research to the next level."

IN HIS AWAY-FROM-WORK TIME, Paul Schmit is a guitarist, seen here playing with his band in Philadelphia.

The Truman Fellowships are three-year appointments. Candidates are expected to have solved a major scientific or engineering problem in their thesis work or have provided a new approach or insight to a major problem, as evidenced by a recognized impact in their field. The program fosters creativity and stimulates exploration of forefront science and technology and high-risk, potentially high-value R&D. A panel of nine senior scientists and engineers reviews and ranks each application and interviews finalists.

This year's panelists were: Dave Chandler (8300, chairman), Cynthia Phillips (1465, co-chair), Joe Michael (1822), Philip Kegelmeyer (8900), Ed Cole (1726), Tan Thai (5630), Phil Dreike (5710), John Dec (8300), and Michael Desjarlais (1640).

Sandia's University Research Office (1911) and Human Resources (3554 and 3555) teamed more than eight years ago to create the Truman Fellowship Program and develop the processes necessary to implement the prestigious position.

Previous Truman Fellowship recipients: Youssef Marzouk, Gregory Nielson, Ilke Arslan, David Scrymgeour, Meeko Oishi, Jacques Loui, Whitney Colella, Anatole von Lilienfeld, Darin Desilets, Bryan Kaehr, Patrick Hopkins, Anne Ruffing, Chris Weinberger, Carlee Ashley, William Chueh, Matt Eichenfield, and Kevin Carlberg.

Sandia's Student Intern Program: Opportunities for students, Labs

STUDENT INTERN PRESENTER Colleen Cooley (6124) discusses her work with Nader Vadiee, coordinator of engineering programs at the Southwestern Indian Polytechnic Institute in Albuquerque, during Sandia's Student Intern Symposium and poster session Aug. 2. Symposiums and poster sessions were held simultaneously at the Labs' campuses in New Mexico and California.
(Photo by Randy Montoya)

By Sue Major Holmes

Sandia interns Colleen Cooley, Matthew Dykstra, and Tiawna Cayton represent a talent pool for the future.

In a given year, Sandia hosts 800 to 1,000 interns, largely college students in technical fields. With a shrinking pool of US graduate students in science, engineering, and math in recent decades, the Student Intern Program gives Sandia a chance to grow its own, says Recruiting and Student Internships Program Manager Margaret Quinn (3555).

More than half of Sandia's interns are in mechanical engineering, electrical engineering, and computer science, mirroring regular staff hiring, says Tally Lobato (3555-2), acting program lead. Sandia also hires interns in physical sciences, math, nuclear engineering, business, and social sciences such as economics, sociology, political science, and psychology. They include year-round and summer interns, most at Sandia/New Mexico but about 150 at Sandia/California, she says.

Websites for DOE and individual labs show it's the largest student intern program among NNSA laboratories; recruiter Juan Abeyta (35553) says it dates back to at least the 1960s.

Matthew (5737), an electrical engineering senior at Purdue University in Indiana, worked this summer on a project he reported on in a poster, "A Magnetic Investigation of Electrophonic Sound," for the Labs' Student Intern Program Symposium and poster session Aug. 2. The research aimed to quantify the source of a noise people hear simultaneously with seeing a meteor breaking up in the atmosphere.

The session drew nearly 60 posters in Albuquerque and 22 posters plus 10 oral presentations in California. It's one of the intern program's larger events, which include a career fair and building professional skills through workshops on resume writing or interviewing for a job.

Poster sessions teach interns how to summarize work and how to communicate essential technical information succinctly to a wide audience, Margaret and Juan say. About 200 interns attended the symposiums in New Mexico and California. New Mexico's symposium was combined with Sandia's University Open House, organized by the Center for Cyber Defenders, and drew faculty from a dozen universities to discuss the importance of graduate school.

"The symposium is not only an exceptional opportunity for our interns to showcase their work but also provides them with the fundamental experience of presenting in a professional environment," says Catherine Culhane (8522), program administrator for Sandia/California.

Sandia President and Labs Director Paul Hommert, addressing the New Mexico symposium's wrap-up session, told the interns they'd contributed to the Labs. "Your energy, your innovation, your thinking — it's always inspiring for all of us to see that."

Paul said graduate students' entry card into a career was their baseline of technical or professional competence. But he also said it's important to be able to communicate complex ideas, to learn by listening and probing, to ask deeper questions in a quest to understand, and to bring individual strengths to a team.

> *"Your energy, your innovation, your thinking — it's always inspiring for all of us to see that."*
>
> **Paul Hommert, Sandia President and Labs Director**

This was Matthew's first summer at Sandia after learning about the intern program at a Purdue job fair. He recently became a year-round intern, and will telecommute during his senior year before going to graduate school in either electrical or aerospace engineering.

Tiawna (5713), whose poster on "Atmospheric Monte Carlo Codes" focused on ground station software to analyze satellite data, was at Sandia for her second summer. She's a year-round intern, telecommuting from West Texas A&M University in Canyon, where she's a senior math major.

Tiawna, who plans to get a master's in either applied mathematics or statistics, says the internship "has been able to open a lot of doors for me."

Colleen (6124), who will obtain her master's in climate science and solutions in December from Northern Arizona University in Flagstaff, presented "Mitigating Climate Change on a Tribal Level," a study of climate change effects on tribal lands and how tribes can help mitigate climate change through renewable energy and green buildings.

Sandia's Tribal Energy Program internship interested her "because it included hands-on experience with solar energy systems, on-grid and off-grid, on tribal lands, and a chance to meet with tribal members, leaders, and educators in the renewable energy field." The best part, she says, was meeting Native American professionals working at Sandia, hearing about their accomplishments, and visiting tribes.

An internship exposes students to Sandia's work, Juan says.

"There's nothing better than getting their foot in the door to get known, to see the opportunities here," he says.

STUDENT INTERNS discuss their work with other Sandians at the Labs' symposium and poster session Aug. 2. About 80 interns presented posters at sessions at Sandia/New Mexico and Sandia/California.
(Photo by Randy Montoya)

Save a life! Training in compression-only CPR offered at Hardin Field

September is Heart Awareness Month. Celebrate by learning how to save a life. Half-hour compression-only CPR training sessions will be offered Thursday, Sept. 20, from 11 a.m.-12:30 p.m. at Hardin Field.

Sudden cardiac arrests kill more than 400,000 people every year in the US. Many who die from cardiac arrest could have survived if responders quickly called 911 and then performed compression-only CPR until help arrived.

Studies now show that continuous chest compression without rescue breathing is as effective as traditional CPR, which people are reluctant to perform for a variety of reasons.

Participants will learn what to do when it seems like someone is having a heart attack, how to assist a choking victim, and how to use a defibrillator.

This is not a course for certification, but participants will also receive information about Sandia's CPR/AED and First Aid Certification courses.

Enroll at the HBE website today (see url below). Prior to training, view the 12-minute Project Heart Start video, produced by Dr. Barry Ramo, a cardiologist at New Mexico Heart Hospital and medical journalist at KOAT-TV.

On training day, wear sunscreen and a hat, as well as comfortable clothes and shoes.

Enroll at HBE's enrollment form on Sandia's internal web at http://tiny.sandia.gov/jo6qw.

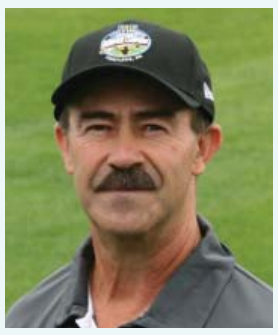
For more information, visit the HBE Heart Start website at http://tiny.sandia.gov/qhe22. — *Stephanie Holinka*

Coach Reno Sanchez guides Albuquerque girls to Little League world championship

Sandia manager led team through a series of lopsided wins on way to victory

By Bill Murphy

What if your field of dreams was bigger than that empty lot behind your house or down the street? What if was bigger than the professional ballpark across town, or even the balloon field that, especially when you're just a kid, seems to go on forever? What if your field of dreams was big as all outdoors? As big as that great wide wonderful world out there?



RENO SANCHEZ

Two years ago, 11 Albuquerque girls, inspired by their coach, Sandian Reno Sanchez (5719), dreamed big. Really big. Late last month, that dream came true, as the Eastdale Girl's Little League team beat all comers to win the world championship, marching to victory in one lopsided win after another. In their six series games, the girls outscored their opponents 67-5.

If anything, their string of victories to get them to the series was even more remarkable: In 17 games they went undefeated, scoring 232 runs to their opponents' 15. This was one monumental, powerhouse team. But their success came as the culmination of two years of focused effort and uncompromising commitment and discipline.

Something very special

Here's the story: When his girls won the New Mexico State championship in 2010 by a blowout score of 26-1, Reno was convinced he was involved with something very special.

"My biggest fear going into this season was that we'd be the second best team in the world and not make it to the World Series because the Southwest Region is so tough."

— Reno Sanchez

"The girls were thrilled with that state championship," Reno recalls, "In the party that ensued, I laid down a challenge — 'ESPN2012.'" The cable-based sports network covers the semifinals and finals of the Girls' Little League World Series, so in other words, Reno was challenging his girls to make it all the way to the series two years hence.

In the following year, 2011, Reno's team again won the district and state championships but lost in the regional championship game to a team from Midway Little League located in Waco, Texas, that was "phenomenal," he recalls. "Since we made it all the way to the regionals with a very young team — eight of the 11 girls were 11 — I figured we had a decent shot at this [i.e. getting to the series in 2012]. We weren't supposed to get that far and we did, so we figured we had a good chance to get there [in 2012].

WE ARE THE CHAMPIONS — Coach Reno Sanchez, in center rear, with his team, the Eastdale Little League girls all-star team, which won the world championship in August.

"My biggest fear going into this season was that we'd be the second best team in the world and not make it to the World Series because the Southwest Region is so tough."

Reno's fears proved unfounded; nothing was going to stand in the way of this team of destiny and its dreams.

Although the girls' big wins made everything look easy, it was anything but. Behind the lopsided scores were hours and hours, days, weeks, and months of hard work.

"When we start our practices, we start on two-a-days, about two weeks of two-a-days. We'll practice 6 to 8 in the morning and then 6:30 to 8 at night," Reno says, explaining his coaching approach. "I've done that my whole career, with every team I've coached."

And his track record has been remarkable: The 48 baseball teams and seven softball teams he's coached have won more championships than he can count.

Regarding those intense two-a-day training sessions, Reno says, "That's one thing I do differently, that a lot of coaches don't do. In fact, when I took over the girls' team [his daughter, Katherine, by the way, is on the team] I was told that you can't do two-a-days with girls, you can't treat them like the boys. And I said, 'Then you'll have to go get another coach because I'm going to treat them exactly like the boys.' I've never expected any less from them."

Other things he thinks have helped him succeed as a coach:

• He gets a lot of people involved. "I usually have two coaching with me [including fellow Sandian Kevin Howard, whose daughter Andrea plays on the team], my official coaches, but I usually have three to five other dads or moms there who can help."

• "The thing I don't like about baseball or softball is that it can be a stationary sport. I want these kids learning something, doing something every second. So I try to keep them fully active."

• "We also have an associated club team, called the Albuquerque Stingers," Reno says, "which is made up of the same girls as our Little League team. What we did is we entered these girls in tournaments to practice for Little League. It's kind of the opposite of what everyone else does."

"When I took over the girls' team I was told that you can't do two-a-days with girls, you can't treat them like the boys.' And I said, 'Then you'll have to go get another coach because I'm going to treat them exactly like the boys.' I've never expected any less from them."

— Reno Sanchez

Would the stage be too big?

The Stingers played in a 14 and under tournament right before the district Little League tournament and went undefeated in that. And then, right before the state championship, the Stingers played in the USSSA 14 and under New Mexico/West Texas state championships. They again went undefeated against 19 teams, beating teams with girls two years older than them.

Incredibly, in a final tune-up for regionals, this 12-and under team took on all comers in a 16-and-under tournament with teams fielding girls who had turned 17 after Jan. 1, going into their junior and senior years in high school. "We won that one as well, going undefeated," Reno says.

Clearly, the girls were well prepared. But going into the World Series, the question mark in Reno's mind was whether the stage, a world stage lit by television klieg lights and cameras everywhere, was, after all, too big even for this great team.

Remembering something he had seen on a monument at Baylor, Reno reminded the girls that there are three kinds of athletes: marshmallows, jelly beans, and rocks.

Marshmallows melt when the heat builds up. Jelly beans are hard on the outside but soft inside and they melt, too, when it gets too hot. But rocks? Rocks are always rocks. "And you girls," Reno said, "are rocks. You've proven it to me; you've proven it to yourselves. So go out there and play the ball. Don't try to play 10 feet tall. Play your game. Be rocks." And they were and are.