Experiments verify key aspect of Sandia nuclear fusion concept

By Neal Singer

Magnetically impled 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 (Magnetically Inertial Fusion), which will see 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

(Continued on page 4)

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)

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 investigitive 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

(Continued on page 4)
That's that

He chose not to bask in glory. Not to rest on laurels. He spurred a 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 44 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 didn’t understand. 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 question—is he as keen 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 for 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 vehicle that carried me to this place. I am here because I was born in an extraordinary 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. I was one of them. But only the first among 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 mispoken word, there wasn’t there. It wasn’t all that. Armstrong noted that the esteemed Member was a modest man, prompting Churchill to lean to emphasize that he was a modest man, which reminds me of the Winston Churchill celebrated 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 quote at a memorial service for a deceased Member of Parliament. The orator 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. 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-suited, pocket protector-donning engineers with whom Neil identified? 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, atmorph@sandia.gov)

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 award is given to individuals or teams who are recognized, 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 (0010), 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 resumes and interviewing. Particular focus is on involving the team in activities that promote and support, 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 the team members are “true advocates on the importance of focusing on the American Indian population to discover exceptional individuals dedicated to providing exceptional service to the nation’s interest.”

The guests are Greg Scharrer (0432), Jesus Otrando (10693), Louis Gregor (10545), Nancy Cline (0853), Paul Graham (10501), Ken Holley (3555-3), Adrianna Casas (1832), Melissa Herron (10667), and Phong Nguyen. (05025)

“Inclusion is Sandia’s choice, and it is an honor to recognize inclusive, respectful, and courageous behavior,” Esther says. Sue Major Holmes

Sound off, offer opinions… Because it’s time for another Lab News/ Daily News reader survey

The Lab News/Daily News reader survey Version 2012 is now open. Simply point a web browser to http://www.surveymonkey.com/s/YXT5B9J. 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 would take much too 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 launched in late 2009. If you can’t remember what it revealed or if you weren’t at the Labs then back, coverage of the survey appeared in the Feb. 12, 2010, Lab News (http://www.sandia.gov/LabNews/labnews02-12-10.pdf) and http://www.sandia.gov/LabNews/ln02-12-10/lab-news02-12-10.pdf).

Among the various approaches SurveyMonkey employs to ensure 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 — labnewsurvey@sandia.gov — has been set up to receive and respond to questions or comments.

Retirees, too! 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 reader 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/0V6CBVR. That site will be open through at least through 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, complete the survey, call 505-844-5605, or write to the Laboratories’ Media Relations & Communications Dept., MS 0165, Sandia National Laboratories, Albuquerque, NM 87185-0165.

The survey also includes a sections 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 ensure confidentiality are to disable storage of respondents’ email addresses and to disable IP address collection.

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Explosive Destruction System keeps pace with changing mission

By Patti Koning

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. These 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, remnants of 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 Fort Glenn. 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 material 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 Haroldson, 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, certain to destruction, and simplicity of manual operation. 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 chemical secret airfield that played a critical role in the Aleutian Islands Campaign. Reports indicate that during the war many 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 defragments 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.

“Putting the vessel in a rotating vessel at a given temperature that used to take overnight. The researchers 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 designed 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 reconnect 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.

The filtration system does not like water, so we had to think about accident scenarios that might release steam into the building.”

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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.

This month’s rollout of AIS will allow Sandia to retire the Corrective Action Tracking System (CATS) and Laboratory Employee 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 FY13. The data in CATS, when an amplifier remains open records will be transferred to AIS. CATS and LESA, says Management System & Tools (MST) 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.

With AIS, says MST, we’ve created a new tool that allows an integrated organization 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 LESAs 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 the processes of managing risk.

“Assurance at Sandia is really a system of mindful behaviors, basic plan-do-check-act processes, and supporting tools,” said MST Executive VP Kim Sawyer addresses Mission Support team at all-hands meeting. “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 on 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 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 his role as Corporate Risk Officer, Pat also will be able to take advantage of AIS to monitor risks that are emerging or that could emerge during the Liftoff phase.

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 Dev 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.

Radiographs taken at nanosecond intervals depicted the implosion of the initially solid beryllium liner through stagnation and to its burn 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 implosion liner with the outer heat-shield liner. The implosion is barely visible, with only its outer shell being visible. However, the more crucial inner surface face remains reasonably intact all the way through to the stagnation — the point at which the implosion of the initially solid beryllium liner becomes unstable. This instability works its way 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 experts were designed to test a sweet spot predicted by the simulations where a sufficiently robust liner could impinge 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.

Consequent results from earlier Sandia computer simulations,” says lead researcher Ryan McNickle (1640). “These results have validated that MagLIF will exceed scientific break-even.”

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 Physics 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.
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 reseat 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's robotic hand to disable IEDs the added advantage of securely grabbing the Such a high-volume production could further reduce the cost.

This 90 percent cost reduction is really a break-through," says Curt. Additionally, because much of the technology resides in the individual finger modules, hands with custom numbers and arrangements of fingers can be quickly made.

"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 will have the same potential, especially given that its high-volume production can further reduce the cost."

Sandia partnered with researchers at Stanford University, Sandia partnered with researchers at Stanford University to develop the hardware and worked with DARPA to help 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 cost for about $1,000 per degree of freedom — $10,000 total — in low-volume production. This 90 percent cost reduction is really a break-through, says Curt. Additionally, because much of the technology resides in the individual finger modules, hands with custom numbers and arrangements of fingers can be quickly made. "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 will have the same potential, especially given that its high-volume production can further reduce the cost."

Using Sandia’s robotic hand to disable IEDs also contributes to mission success.

Becky says diversity in the workplace pays off for the well-being of others, a genuine valuing of all individuals and the mission. Employees who feel included, respected, valued, and included are more engaged and turning it into behaving differently."

People are holding diversity dialogues and coming up with more ideas to the table.

"We give better service and products to the nation if we accept that diversity, and value it."

"Inclusion is making that leap to embrace the diversity and extract value from that diversity."

"The white men were asked by the people of color, 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 integral part of the organizational 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."

"We have a committed set of people working to make hereida 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."
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 (6231) 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 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 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.

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 repli-

cated that several times on different tasks, so it seems like it’s robust," she says.

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 Neurotechnology Society conference in Chicago. Her team monitored test subjects’ brain activity while they used their natural approach to memorize word lists, and then gave them a memory test. Laura says that averages about seven items, such as new recruits, and see if the high performers did even better after memory training.

“Right now it’s very abstract kind of memory, memorizing word lists," she says. “T 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 U.S. 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 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 tasks that the 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 mem-

ory 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 tell them on ‘strong pass-

word,’ 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 quite different than what they saw before.”

The Center for the Advanced Study of Language at the University of Maryland provided the working mem-

ory materials but had no financial involvement in the study Laura designed. Now she and the center are work-

ing 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 how well we can best use strategies between different strategies for different tasks,” Laura says.

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 these 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.

“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.”

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

Laura’s cognitive systems group, where Laura works, often does Work for Others, including the military. The U.S. 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 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 really a 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 tasks that the training did not carry over to other tasks, Laura says.

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ory training simply tried to push the limits of memory capacity.

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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 doubling the number competing in 2011. Texas Tech University was again triumphant in the "novel design" category of the microelectromechanical systems (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 machines, 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 in mass allows for the detection of adsorption, which is a fundamental chemical process. This year, Carnegie Mellon students adsorbed water vapor onto microrelay contacts to increase their electrical resistance.

Carnegie Mellon professors of Optics and Photonics. Carnegie Mellon professional oversight was provided by Maarten de Boer. Texas Tech students were supervised by TTU faculty advisor Tim Dallas. The contest, called the University Alliance Design Competition, now includes Mexican as well as US universities. Sandia executives led by Div. 100 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.

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, Universidad of Oklahoma, Universidad 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 graduates 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 Weapons 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.

(Photos by Randy Montoya)
Body conscious
Website aims to keep you on your feet, out of the ER
By Nancy Salem

There’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 a way 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 starting 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.”

What’s causing our injuries?

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 some of the 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-heal, non-slip footwear

Where’s Pat?

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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 she has to see to believe, https://info.sandia.gov/esh/livesafe/images/content-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 railings, 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.”

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.”

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Corporate incident rate, by cause

Epic safety fails . . . don’t try these at home
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, who recently earned her doctorate in biochemistry and molecular biophysics from Caltech, is working in Computational Materials Science and Engineering Dept. 1644. Her manager, Charlie Nakhleh, 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, 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 from numerous applications, 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 her BS in biochemistry and molecular biophysics. Her doctoral dissertation at Caltech was titled “Minimum Energy Paths and Nucleation Events in Liquid Membranes.” Christina has been an 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 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 waves into plasma thermal energy at selected locations of the particle energy distribution function 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 2012/2013 magnetic PIC code development project is very ambitious and would undoubtedly merit a very notable advance.”

The Lab News recently asked Christina and Paul to describe the work they intend to pursue at Sandia.

Christina Ting — “The interaction of nanoscale objects with liquid membranes is a common theme underlying a number of important phenomena in biotechnology, ranging from pathogen invasion to non-estric cellular toxicity to the delivery of medical therapeutics. Importantly, membranes are soft matter systems comprised of lipids that self-assemble into fluid bilayers. As such, they fulfill a wide range of functions, 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 nuclear 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, a methodology 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 insights gained will also provide new methods for the tailoring of materials with soft matter properties. Moreover, the tools developed to study membrane 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 required to heat and compress the gas in the first place. The achievement of nuclear fusion breakthroughs will be a major advancement of fusion energy and will provide the means and the context to extend this research to entirely new territory, where novel wave effects could potentially make cutting-edge methods to achieve fusion easier to realize. The mentorship of world-class scientists, research facilities, and computational power at Sandia enable the rational design of innovative medical therapeutics.”

“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 significant engineering challenge 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 prize recognizes their 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 (1022), Philip Kegelmeyer (8060), 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.


IN HIS AWAY-FROM-WORK TIME, Paul Schmit is a guitarist, seen here playing with his band in Philadelphia.
Sandia’s Student Intern Program: Opportunities for students, Labs

By Sue Major Holmes

Sandia interns Colleen Cooley, Matthew Dykstra, and Tiawna Cayton represent talented 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). Recruiting and Student Internships Program Manager Margaret Quinn (3555). Recruiting and Student Internships Program Manager Margaret Quinn (3555). Recruiting and Student Internships Program Manager Margaret Quinn (3555).

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The session drew nearly 60 posters in Albuquerque. Posters 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.

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

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/qlhe22.

— Stephanie Holinka

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— 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 it was bigger than the professional ballpark across town or even the whole country? What if it was something whole world out there?

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 233 runs to their opponents' 15. This was one monumental, powerhouse team.

Then there were all the factors that made it possible.

“Nothing was going to stand in the way of this team of destiny,” Reno says. “We weren’t supposed to get to Little League 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 according to dreams.

Although the girls’ big wins made everything look easy, it was anything but. Behind the lopsided scores were hours and 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 the 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.”

• 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 those 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, “and that 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.”

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.

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 your- selves. 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.