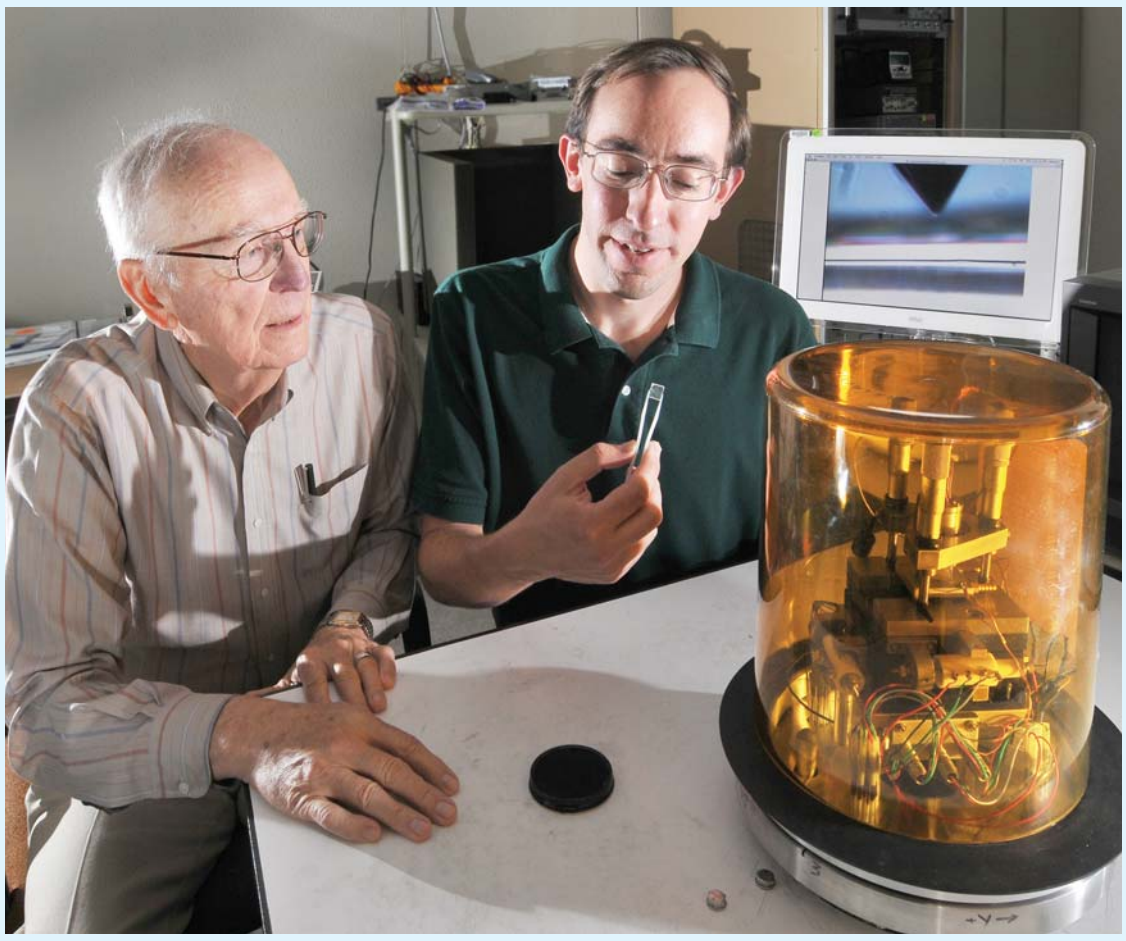
Elastic salt? That's a stretch



SALTY — Jack Houston, left, and Nathan Moore (both 1114) examine a tiny salt block while the screen behind them shows the magnified tip of the Sandia-developed interfacial force microscope (device in the foreground) performing another materials interrogation. (Photo by Randy Montoya)

By Neal Singer

To stretch a supply of salt generally means using it sparingly.

But researchers from Sandia and the University of Pittsburgh were startled when they found they had made the solid actually stretch.

"It's not supposed to do that," says Sandia principal investigator Jack Houston (1114). "Unlike, say, gold, which is ductile and deforms under pressure, salt is brittle. Hit it with a hammer, it shatters like glass."

The research team from Sandia and Pitt was engaged in a preliminary investigation of salt's properties for desalination studies when the serendipitous discovery was made.

Poking salty water through membranes

"We were interested in learning what happens when you try to poke salty water through membranes with tiny pores," says Jack. "So we tried first to characterize the qualities of salt when dry."

Nathan Moore (1114), investigating with the nanotip of a tool called an interfacial force microscope (IFM) developed by Jack, found with surprise that the brittle substance appeared malleable enough to stay with the tip as it left the surface of the salt, forming shapes that extended into relatively lengthy fingers of separation from the main body.

Examination led by Jianyu Huang (1132) with a transmission electron microscope (TEM) at the Sandia/Los Alamos Center for Integrated Nanotechnologies (CINT) showed that surface salt molecules, like the surface of water when an object is withdrawn, formed a ductile meniscus with the IFM tip as it withdrew from penetrating the cube. But unlike water, the salt meniscus didn't break from its own weight as the tip was withdrawn. Instead it followed the tip along, slip-sliding away (so to speak) as it thinned and elongated from 580 nanometers to 2191 nm in shapes that resembled nanowires (see image on page 4).

As a possible explanation, offers Jack, "Surface molecules don't

(Continued on page 4)

Sandia LabNews

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Sandia National Laboratories

After 60 years, Sandia to cease most Machine Shop operations

Decision affects New Mexico site

After more than 60 years, Sandia has decided to cease most of its Machine Shop operations in New Mexico. In arriving at the decision, senior management cited the declining need for specialized machining services and the high cost of maintaining an in-house capability. Story on **page 7.**

Ethics & Business Conduct Office sees a supportive strategic role

Dave Palmer moving to center director position

By Chris Burroughs

Sandia's Ethics and Business Conduct Center 12400 is investigating an increased caseload these days — something new director Dave Palmer sees as both a challenge and an opportunity.

Halfway through the fiscal year the Ethics Office has seen a 50 percent increase in cases over all of FY08. Staff are also noting a rising number of requests for guidance on specific ethics issues.

ETHICS OFFICE Senior Manager Cynthia Schneeberger, above, says an uptick in activity in the office could be attributable, in part, to the national economic downtown. (Photo by Randy Montoya)

More proactive

"This increase challenges us to be more proactive in reaching out to help people and groups with useful tools, training, and earlier intervention," Dave says. "It also gives us an opportunity to bring a perspective to the Labs leadership that can help them in decision making and assist in moderating case increases."

Why the increase? Cynthia Schneeberger, Ethics Office senior manager (12410), says given the current environment "it is understandable that the center is seeing a rise in inquiries and cases."

"There are a number of changes underway at Sandia and within the complex that factor into the uptick in activity," she says. "In addition, we are observing external factors that play a role, such as the economic downturn and ethical concerns arising from the nation's banking industry."

She adds that employees seem to be more aware of ethics issues, possibly due to the recently issued Lockheed Martin-developed Ethics Code of Conduct book-

(Continued on page 4)

Sandia increases cap for royalty awards

By Chris Burroughs

Some Sandia inventors may be receiving more in royalty awards thanks to an increase in the amount for which they are eligible.

The cap for royalties has gone up from $150,000 per year to $500,000 per year.

Inventors and divisions receive royalties for intellectual property (IP) licensed by the Labs to external entities. They are distributed as awards through the Royalty Sharing Program. IP includes patents, copyrighted software, trademarks, or any combination thereof.

Mark Allen, manager of Intellectual Property Management, Alliances, and Licensing Dept. 1031, says the cap was raised because some of the licenses are starting to generate large royalties, and Sandia wants to ensure its inventors can more fully participate in the upside.

"A few people are receiving royalties in the tens of thousands of dollars range, and

(Continued on page 5)

Hydrogen road show comes to Livermore

DRIVING CHANGE — 100 people gathered in downtown Livermore, Calif., to test-drive hydrogen-fueled automobiles from major automakers as part of the Hydrogen Road Tour. Read all about it in the story on **page 3.**

Also inside . . .

That's that

So there we were, standing around the watercooler (metaphorically) talking about how Sandia has been the premier employer in Albuquerque for decades now. I guess it was on our minds because we're marking our 60th anniversary this year. In this day and age, for an organization — any organization — to stay at the top of its game for 60 years is something pretty special. It was simple: If you lived in Albuquerque, you wanted to work here and so did your kids. Knowing there was a potential job waiting for them at the Labs served as a pretty good motivator for Sandia offspring to go into math, science, and engineering.

Anyhow, during the course of the discussion, we started talking about third-generation Sandians we know. I don't have a count, and I'm not sure anybody does, but my guess is that there are more than a few of us whose grandparent and parent also worked here.

And that got me wondering: Are there are any fourth- or even fifth-generation Sandians around? By my back-of the envelope calculation, I figure it's possible. Say your great-great-grandfather started with Sandia in 1949 at the age of 50. His 30-year-old daughter — that would be your great-grandmother — also started here at the same time. Your grandfather was 10 years old in 1949; eight years later, right out of high school, granddad signed on with Sandia in 1957. He got married right away and a year later, in 1958, your mother was born. She started in at Sandia as a 22-year-old in 1980, got married and gave birth to you in 1985. You finished up graduate work in May 2009 with a master's degree in computer science from the University of New Mexico. You were hired this month, after working here as an intern for the past six years.

So, did your great-great grandpa work here? Or your great-grandma? If you're out there, I'd love to hear from you.

* * *

The other day a friend and fellow Sandian mentioned that his father, who is quite elderly, probably doesn't have long to live. I expressed my condolences, mentioning that I lost my own father just a couple of years ago. My friend started talking about his dad's optimism, his joyful approach to life, his unfailing cheerfulness, his courage in the face of a fight that will ultimately claim his life. If he was your friend, he was your friend for life. Never met a stranger. Was always ready to help anyone in need. Not a bitter or mean-spirited bone in his body. I said, "He sounds like a great man," to which my friend replied, "Oh, he is." I started thinking about my own father and the marvelous and unique qualities that made him who he was.

It's funny: When you're younger, you figure all the great men and women live somewhere else — Washington, New York, L.A. And then one day you realize that the great men and women have an office just down the hall, live next door or right under the same roof, have held you in their arms and made you who you are.

* * *

Did you come out for Family Day? Apparently a lot of folks did; The official count was more than 12,500 attendees. According to a *Lab News Interactive* poll question, a majority of those who actually attended reported that they had a "great" or "good" experience. My wife and I thought it was a marvelous day. Like most attendees, we didn't get a chance to do everything we wanted to, but we still saw and experienced enough to get a pretty good feeling for the incredible range of work we do here. I was especially impressed with the talk by Ron Knief (1382) in Tech Area 5 about the Annular Core Research Reactor and the Sandia Pulse Reactor. If other presentations around the site were as good as his, it was a very good show, indeed.

Speaking of that poll I mentioned above, I do agree with a couple of recurring themes in the comments section: Do Family Day more often than every 10 years, and make it longer than six hours. My hunch is that the planners are taking those suggestions to heart.

See you next time.

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

Sandia LabNews

Sandia National Laboratories

http://www.sandia.gov/LabNews

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LOCKHEED MARTIN

Retiree deaths

Arthur A. York (age 92)	Feb. 1
F.B. Baldonado (86)	Feb. 2
Joyce L. Coffee (90)	Feb. 2
Doris M. Young-Mitchell (93)	Feb. 5
Manuel P. Lucero (91)	Feb. 5
Willie J. McCabe (84)	Feb. 6
Mavis H. Bowland (93)	Feb. 13
James F. Wolfe (90)	Feb. 14
Eliseo L. Chavez (83)	Feb. 15
Mildred L. Karver (88)	Feb. 17
R. Neil Horton (67)	Feb. 19
James A. Davis (69)	Feb. 23
Roy Charles Rentzsch (73)	Feb. 25
Carolyn J. Townes (71)	Feb. 26
Robert S. Blackburn (81)	Feb. 27
George E. Tucker (79)	March 2
Geraldine S. Nerton (91)	March 3
Frances Cecilia Diener (59)	March 4
Joseph R. Ashcraft (80)	March 5
David E. Salas (79)	March 6
Lawrence E. Myers (93)	March 6
Satoru G. Hirota (71)	March 6
Wesley B. Estill (84)	March 8
Margaret E. Lloyd (93)	March 9
John H. Leroy (78)	March 9
C.F. Wilson (81)	March 13
Rosalie A. Gallegos (80)	March 13
Melvin A. McCutchan (90)	March 14
Henry M. Willis (83)	March 29
Pauline A. Laforest (80)	April 1
Walter Bauer (74)	April 4
John Emil Haaland (94)	April 15
Carlos M. Ortega (91)	April 16

Employee death

Jim Yoder was a cheerleader for all who worked with him

Jim Yoder (5928) died May 25. He was 67 years old and had been at Sandia more than 42 years. Dolly, Jim's wife, works in Dept. 10669.

"He was the manager of Emergent Threats Dept. 5928, which identifies and analyzes potential future concerns to US national security," says Gary Laughlin (5920). "He developed partnerships throughout the laboratory and the country to enhance our understanding of the direction of science and technology research around the world and how it may be applied in military or asymmetric applications against us."

JIM YODER

Jim died on his and Dolly's 41st anniversary. "I kidded him about not getting me my anniversary present," says Dolly. "He was a great man."

"Jim told me he didn't support me because we were friends, he supported me because the world was a different place because I was in it," says retiree Fred Mendenhall. "Jim tended to view things uniquely. He lived his life judging himself and those he led not by the standard politics or definition of success of the day, but by the change we were striving to make in the world. 'Find a great purpose and live your life making that purpose happen,' he would tell me. 'It doesn't matter if you work here or elsewhere, it doesn't matter if others agree with you or not, just commit yourself to your purpose and follow it relentlessly.' Jim lived by these words."

Eleanor Walter (5928) worked for Jim for 12 years. "He let you do your work, minimized administrative detail, and was a cheerleader for everyone's accomplishments. He was devoted to his family and once shared a letter written by his grandson Stuart with me. Stuart's assignment was to write about your favorite person. He wrote about Jim. The letter ended '. . .and I know he loves me.' Jim was very proud of that letter."

"Jim and I met as pilots in the Kirtland Aero Club," says retiree Michael Callahan. "We became friends flying together. Jim liked to seek out the trademark New Mexico sights — volcanic plugs, mesa-top runs, World War II practice bombing targets, the Sandias, rain squalls, and rainbows. He was knowledgeable, curious, soft-spoken, and quick to laugh."

When Bill Richard (5526) came to Sandia, Jim was his mentor. "I found him to be innovative, energetic, and amazingly astute of political situations," says Bill. "One conversation I remember vividly occurred shortly before performance review. Jim was concerned that I might not get the recognition that he thought I deserved. Jim told me, 'Bill, it is important for you to get exposure. It really does not matter whether it is good or bad — just exposure.' When I questioned the 'good or bad' he added, 'Management will most likely have forgotten what you did, but at least they will remember your name.'"

"I have been privileged to know Jim Yoder for about 20," says John Taylor (0303). "When you work closely with a person for that length of time, you get some measure of the person's character and passion. Jim was one of those individuals that you just knew would walk with you through whatever travails you were encountering. He was passionate about his people and his work. That work, although it may remain shrouded from public display, perhaps forever, has made an indelible contribution to our nation's security. He was a wonderful person and a dear friend."

"One of Jim's favorite restaurants in Arlington, Va., was the Portofino restaurant," says Mike Valley (1512). "One night when we were there the owner asked if we were having a nice time. Soon the owner was sitting with us. Jim and the owner were sharing stories of Italy. Jim was the kind of guy that people were naturally drawn to."

Kathleen Sanderson says "the long and short of it was Jim was a great man who worked tirelessly to help make our nation and the world a safer place."

"Jim would get lost in museums," says retiree Steve Dupree. "He had to read everything about everything."

Diane Cline was his office management assistant for 11 years. "Jim was highly intelligent, patriotic, and dedicated to his work at Sandia and his country," says Diane. "His only greater love was for Dolly and his family.

"Anytime I needed Jim's signature, he would say the charge was 'two bucks.' After 11 years and many, many signatures, I owe him quite a few bucks. I'd gladly pay my debt if he could only be back in that office next to mine once again. Jim was an honorable man, and it was my privilege to work for him." *— Iris Aboytes*

Test driving the future at the Hydrogen Road Tour

By Patti Koning

Ordinarily, you don't see people lining up to test-drive cars, but Thursday, May 28, was not just any day in Livermore. A crowd of more than 100 people gathered downtown for the opportunity to get behind the wheel of hydrogen fuel cell-powered vehicles from major automakers including Honda, Toyota, Nissan, Volkswagen, and GM.

THE FUTURE OF AUTOMOBILES? — People line up to test-drive hydrogen fuel cell vehicles in downtown Livermore, Calif. (Mercedes-Benz shown). (Photo by Randy Wong)

This was the 10th stop on the Hydrogen Road Tour, an eight-day event organized by the California Air Resources Board, California Fuel Cell Partnership, National Hydrogen Association, US Fuel Cell Council, and Powertech Labs (on behalf of British Columbia).

"The purpose is to show the public that hydrogen fuel cell cars are not decades away from market," says Chris White of the California Fuel Cell Partnership.

Sandia organized the Livermore stop in partnership with the City of Livermore and Livermore Downtown Inc.

"We are honored to be part of this event. Sandia has been involved in hydrogen research for well over 45 years and hydrogen energy since about 1994," says Jay Keller (8367), hydrogen program manager. "Our hard work has helped put these vehicles on the road today."

The road tour brought out a diverse crowd that included scientists, auto enthusiasts, and the simply curious. Pleasanton resident Dan Stewart pulled his two sons out of school for a few hours to check out the road tour, and at the urging of 15-year-old Clint, signed up to test-drive one of the cars.

"I think it would be really cool to use hydrogen to power a car," says Clint, a high school sophomore. "It would be much better for the environment."

Livermore Police Officer Mony Nop also paid a visit.

"I'm really excited to see so many different kinds of cars. I thought it would be just one company," he says. "These seem like great vehicles. I talked with one guy about how fast he was able to drive — I won't mention the exact speed to keep him out of trouble."

Transportation Energy Center 8300 Director Bob Carling, Metal Hydrides Center of Excellence Director Lenny Klebanoff (8367), Terry Johnson (8365), Daniel Dedrick (8365), and other Sandia staff members came out to the road tour. Lenny spent time among the crowd answering questions about hydrogen fuel cells in general and Sandia's program.

The cars don't look much different from other cars on the road — which was exactly the point. Larry Goltz, a Livermore insurance agent, pointed out one key distinction. "Look what's coming out of the tailpipe — water," he says.

After driving a Honda FCX Clarity for about a quarter-mile around downtown, Goltz was ready to take it home. "I'd buy this car if I could. It's a quiet, smooth, easy drive, but more important, I think this is our future. We need to stop importing fuel," he says.

The FCX Clarity is one hydrogen fuel cell car you could very well see on the road, at least in Southern California. Honda has begun leasing the car to customers in the Torrance, Santa Monica, and Irvine areas at $600 per month, which includes maintenance.

"Right now there is limited infrastructure, so we're targeting areas with hydrogen refueling stations," says Kent Dellinger, a government relations manager with Honda. "We're hoping this tour will get the attention of our legislators, to show that fuel cell vehicles are not the distant future, they are now."

Honda is not alone in the fuel cell car marketplace. Toyota has said that it will be selling fuel cell cars by 2015, and Hyundai Motor Co. and Daimler AG both have plans for selling hydrogen vehicles to retail customers.

"If you listen to those directly responsible for selling hydrogen fuel cell vehicles to the consumer, it seems clear that commercialization and marketability of these vehicles is moving a lot faster than we anticipated," says Jay.

Progress in hydrogen R&D is real and significant

According to the California Fuel Cell Partnership, the hydrogen research community has consistently met or exceeded the DOE Hydrogen Program's ambitious goals for energy efficiency, vehicle range, system durability, and reduced costs. Sandia, says Jay, has been involved in several key advances.

"Through our safety, codes, and standards work, we've been instrumental in the National Fire Protection Association's rewriting of the model codes that local municipalities need to put hydrogen in commercial applications," he explains. "This is not insignificant, as those agencies now have formal, written safety codes that allow them to work hydrogen into their commercial infrastructure."

In fact, Jay does not see the infrastructure — refueling stations — as the major obstacle to bringing fuel cell cars to market. He says changing the infrastructure of the fleet poses a bigger challenge.

In addition, DOE's Metal Hydride Center of Excellence (MHCoE), led by Sandia, continues to make progress finding a suitable new material that can soak up and concentrate hydrogen into a small volume, release the hydrogen when needed, and then repeat this cycle over and over for vehicular applications.

As the lead organization for the MHCoE effort, Sandia coordinates the work of some 18 organizations engaged in several promising areas of research. Sandia also is contributing to materials development work and helping direct research by refining materials theory.

Finally, Sandia's work on a hydrogen internal combustion engine — considered a transition strategy designed to pave the way toward fuel cell vehicles — is supported by both Ford and BMW.

Road tour grabs media attention

Potential drivers weren't the only ones lining up to check out the hydrogen fuel cell cars in Livermore — major media outlets also were out in force. Reporters from KQED's Quest, the *Valley Times*, and *San Francisco Chronicle* all took test drives and the event was featured on prime-time news broadcasts on CBS, NBC, and ABC. For more on the Hydrogen Road Tour, visit www.hydrogenroadtour.com.

HYDROGEN HOW-TO — A representative from the Hydrogen Road Tour, center, demonstrates a model hydrogen car. (Photo by Randy Wong)

Sandia CaliforniaNews

MITRE turns to Sandia for DHS systems engineering institute

By Mike Janes

Sandia will serve as a key partner with the Homeland Security Systems Engineering and Development Institute (SEDI), a new federally funded research and development center (FFRDC) recently awarded to MITRE.

A nonprofit organization with principal locations in Bedford, Mass., and McLean, Va., MITRE applies expertise in systems engineering, information technology, operational concepts, and enterprise modernization to address its sponsors' needs.

SEDI will coordinate support to the Department of Homeland Security and its mission partners to protect the nation from terrorist threats, aid the flow of legal immigration and commerce, and recover from natural disasters and other national emergencies. While MITRE is the prime (lead) advisor on the SEDI initiative, Sandia is a member of MITRE's Public Interest Network Integration Council (PINIC), which essentially serves as a "preferred supplier" and resource that MITRE will draw upon.

Sandia's participation in SEDI, says Homeland Security and Defense Systems Center 8100 Director Jill Hruby, is significant in that it brings the Labs a big step closer to having a longer-term, enduring role with DHS.

"SEDI is meant to provide systems engineering in a way that's institutionalized to DHS," says Jill. "This should help establish Sandia as a key systems engineering lab in the eyes of DHS, and will move us closer to being a partner as opposed to a contractor for DHS."

In addition, Jill says opportunities should expand as MITRE and other SEDI partners come to know and appreciate Sandia's quality work.

Though the specific SEDI activities Sandia will be asked to participate in are not yet defined, such activities could involve a broad range of homeland security projects. Jill points out that systems engineering is "what we do" at Sandia; recent projects with a significant systems engineering component include the Integrated Public Alert and Warning System (IPAWS), Sensing Nodes Inform and Facilitate Fast Emergency Response (SNIFFER), Interagency Biological Restoration Demonstration (IBRD), and a number of projects performed on behalf of the Domestic Nuclear Detection Office (DNDO).

Stretchy salt

(Continued from page 1)

have buddies." That is, because there's no atomic lattice above them, they're more mobile than the internal body of salt molecules forming the salt block.

Another possibility considered was that the TEM electrons (used for viewing the process) break up the salt crystals into tiny grains, allowing rapid atomic diffusion along grain boundaries and permitting nanowires to form and extend. Or the TEM electrons might change sodium from its ionic to its atomic state, where cohesion is weaker and bonding can take place in any direction.

Still, more sparing use of the TEM as an observational tool did not stop the superplastic lengths from occurring. Their lengths increased when the TEM stayed on during the entire experiment, but they were still there and still long when the TEM was used only occasionally and briefly during the process.

'Totally surprising'

While solder creates a liquid-like surface when modestly heated, the fact that salt showed signs of surface mobility at room temperatures was "totally surprising," says Jack, who had initially intended to study more conventionally interesting characteristics of the one-fourth-inch square, one-eighth-inch-long salt block.

What this means for oceans, quarries, smog, or deer licks is that salt molecules, if forming nanowires rather than remaining inert, might be causing hitherto unobserved but unpleasant effects.

In a paper published in the May *Nanoletters*, the researchers write that "understanding the deformation of NaCl [common salt] is particularly important for relating laboratory-scale measurements to geotechnical problems, and for understanding the physiochemical reactions of sea salt aerosols. The latter have been implicated in problems as broad as cloud nucleation, smog formation, ozone destruction, and triggering asthmatic responses in humans."

Other researchers on this work include Junhang Luo and Scott Mao from the University of Pittsburgh.

In unrelated work that also involved a surprisingly mobile surface, Jack with colleagues Matt Goertz (1132), presently a postdoc at CINT, and X.Y. Zhu at the University of Minnesota, followed up on a centuries-old argument about what makes ice so slippery. Their aim: to map the characteristics of the slickness.

A variety of explanations

The original explanation, by dedicated experimentalist Michael Faraday, that a very thin liquid-like layer of water existed at all times atop ice, was rejected by Lord Kelvin, who agreed that water's presence did make ice slick but announced — apparently more by fiat than experiment — that its presence was the result of pressure-melting of the ice, says Jack. Later work suggested that heat from friction — as an ice skater or car moved over ice — caused water to appear.

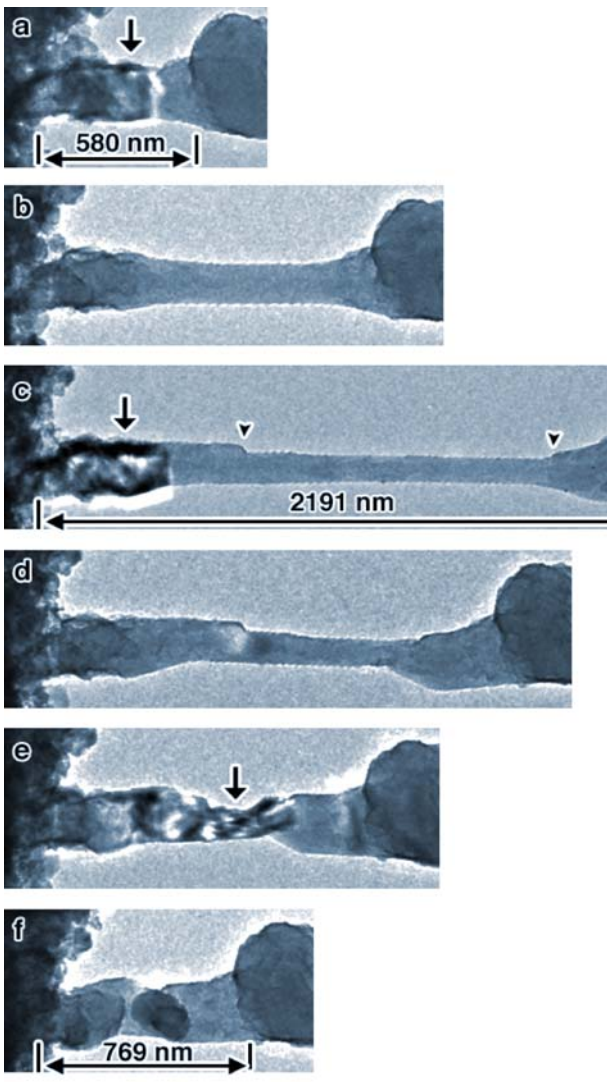
Still, says Jack, it was clearly shown that the weight borne by ice, even from skaters was far below that required to produce enough water to maintain the slipperiness of the thin lubricating film.

Presently, it appears that ice is representative of a self-lubricated material, says Jack. Its thin liquid-like layer of water keeps people, sleds, skates, and other objects sailing above the small but craggy roughnesses of its surface like shaving cream allows a razor to slide above, not on, skin, while mowing down bristles of hair. A wide range of physical exploratory techniques has agreed that this is actually the case. (The term "liquid-like layer" is a technical term used by scientists to describe water that through premelting possesses physical properties between those of water and ice).

Jack and his group confirmed with the IFM yet again that liquid-like water exists atop ice, determining that it creates a kind of capillary-like action with slipperiness that decreases in effectiveness as temperature decreases. The technique gave accurate measurements of the thickness of the aqueous surface layer and the most complete picture to date of its behavior.

This work is currently published in the March 31 issue of the journal *Langmuir*.

Both research efforts were supported by DOE's Office of Basic Energy Sciences. The salt research was also supported through the University of Pittsburgh by the National Science Foundation.



TIME-LAPSED TEM IMAGES showing superelongation and compression of a nanowire. The Au STM tip (not shown) is adhered to the NaCl grain at the right side of these images. The nanowire was elongated from a length of 580 nm (a) to 2191 nm (c). Arrowheads point to examples of steps on the nanowire surface. Arrows mark crystalline contrast.

Ethics office

(Continued from page 1)

let, the annual Ethics Awareness training, and the Lockheed Martin Integrity Minute — short videos that portray common ethics issues.

"All of this brings more activity to the office," Cynthia says. "More people are calling with questions or if they aren't sure if something crosses an ethical line."

While many of the cases may involve similar issues, details and complexity differ. Areas receiving the most scrutiny include interpersonal skills/management disputes, research misconduct such as plagiarism and authorship, abuse of email, conflict of interest, and compliance with policies such as time charging.

Cynthia encourages people to contact her office with ethical concerns, to get information, or to simply discuss an emerging issue. Office contacts can be made by walking in (Bldg. 750), calling (505-844-1744), or sending a UCI letter.

"Reports are kept confidential to the fullest extent possible," Cynthia says. "The staff in the Ethics and Business Conduct Office is responsive and helpful. We want to understand the facts and truth, and we treat everyone in the process with fairness and objectivity."

The Ethics Office's sister organization, Corporate Investigations Dept. 12420, has also seen an increase in its caseload. Corporate Investigations looks at waste, fraud, abuse, workplace violence, and theft. FY08 was a busy year, but FY09 is even busier. During the first two quarters of this fiscal year, the office has already experienced a 100 percent increase in cases from the previous year's investigation caseload.

To learn more about the Ethics and Business Conduct Center visit its website at http://info.sandia.gov/ethics/Design/ethics-update/ethics_Main.htm. It provides ethics information and guidance, as well as ways people can bring forward a concern or just inquire about an ethics question.

"High ethical standards are good for the company," Dave says. "It is simply a core aspect of our laboratory reputation and the way we operate — it is something that our employees and customers can count on."

Sandia Ethics Office part of Lockheed Martin program

Sandia's Ethics Office works closely with the Lockheed Martin Ethics Program and is included in the company's annual ethics rating.

Last year Lockheed Martin was ranked in the top 10 of US government contractors in the area of ethics by *Ethicsphere*, a magazine devoted to ethical behavior by companies.

"I am proud that Sandia shares Lockheed Martin's commitment to ethics and disclosure and appreciate what everyone does to maintain the Laboratories' high standards," said Executive VP, Deputy Laboratories Director, and Chief Operating Officer Al Romig, in a memo to all employees about the *Ethicsphere* rating.

Dave Palmer new ethics director

Dave Palmer is the new director of Ethics and Business Conduct Center 12400.

He is also serving as acting director of Independent Audit and Advisory Services Center 12800 until a permanent director is selected for that group.

DAVE PALMER

"I am very pleased to announce Dave's selection as Sandia's new director of Ethics & Business Conduct Center," Labs Deputy Director Al Romig said in a statement last month. "During his 32 years at Sandia, Dave has demonstrated leadership in a variety of positions and has a proven success record."

Dave has served in a number of capacities at Sandia, including chief audit executive, director of procurement and logistics, and other capacities in Sandia's Accounting and Finance, Human Resources, and Supply Chain organizations in both New Mexico and California.

Sandia/Lockheed Martin honor Thunderbird winners

OVERCOMING ADVERSITY — 2009 recipients of the Sandia/Lockheed Martin Thunderbird awards share a proud moment during a luncheon in their honor. The awards recognize students from 22 public, private, and charter schools in the greater Albuquerque area who have overcome adversity in their lives. With the recipients is Sandia Public Relations and Communications Center 3600 Director George Rhynedance, right. (Photo by Lloyd Wilson)

Students present MEMS designs at Sandia contest

Sperm-sized microswimmer, tribogauge the big winners

By Neal Singer

On May 19, student winners of the fifth annual Sandia-sponsored MEMS University Alliance Design Competition, aided by their professors, presented their visions of astonishingly tiny yet productive machines to the scrutiny of Sandia's seasoned microelectromechanical systems group — arguably one of the most advanced MEMS design and fabrication groups in the world.

The 2009 winner in the "novel device" category was a "microswimmer" the size of a sperm and designed to swim like one, its aluminum tail whipping back and forth as it is heated and cooled by periodic bursts of microwave radiation. The design was created by Kevin Bagnall of the University of Oklahoma's School of Aerospace and Mechanical Engineering, and presented by graduate student Jeff Lantz under the direction of professor Harold Stalford.

Fantastic Voyage

"Think *Fantastic Voyage,*" says Sandia senior microfabrication manager Tom Zipperian (1740), referencing, as a possible future use for the design, the movie that portrayed a vessel shrunken enough to navigate the human body by touring its bloodstream.

A second area of competition — a device to characterize and test the reliability of tiny devices — was won by a design that Texas Tech University students termed a "tribogauge," used to determine the wear, friction, stiction, and lubrication of moving parts of MEMS devices, on-chip and in situ. (These determinations are called tribological.) The work was presented by student Ganapathy Sivakumar under the direction of associate professor Tim Dallas.

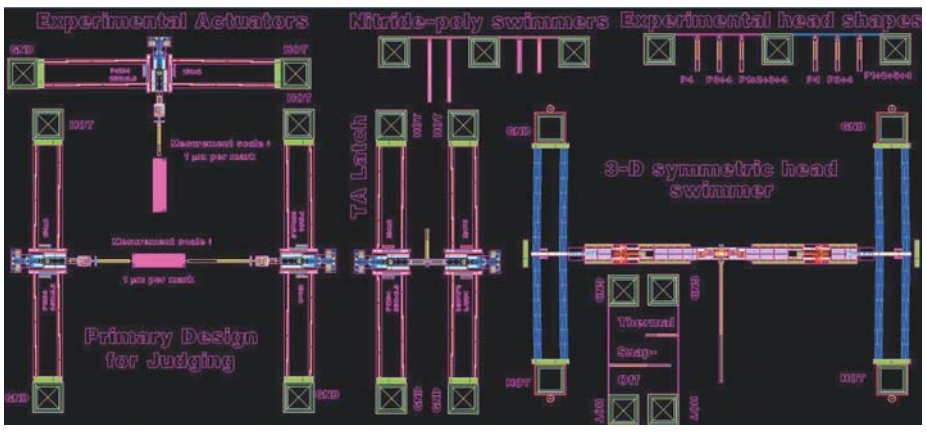
Also participating in this year's contest were the University of Illinois at Urbana-Champaign, the University of Utah, and the Air Force Institute of Technology.

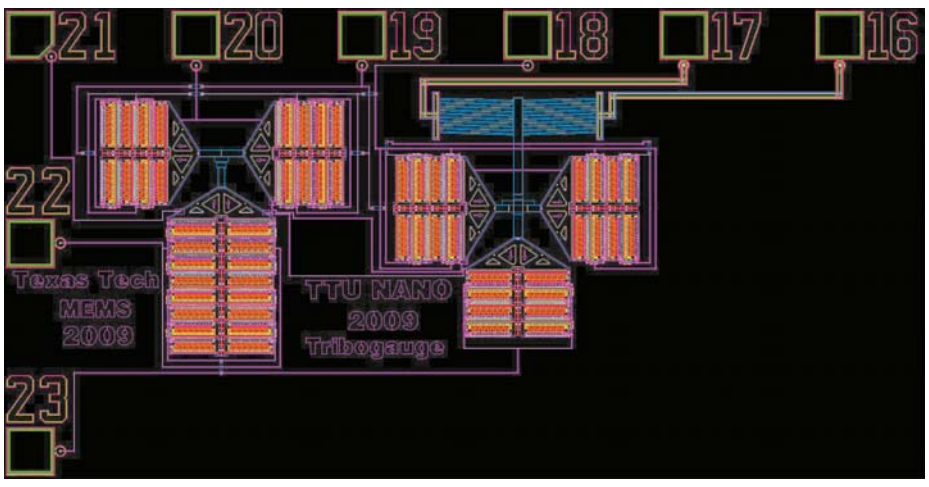
"This year's group was again very competitive," says design contest leader and MEMS Core Technologies team lead Mark Platzbecker (1749). "Each year, the designs get better and the associated white papers more professional."

Among universities now going through the process to join the alliance but not yet signed up are Cornell and the University of New Mexico. Duke University and the Rose-Hulman Institute of Technology in Terre Haute, Ind., have also expressed interest. More than 20 educational institutions are members of the alliance.

The contest, which took place in a conference room at Sandia's MESA center, is intended to take students beyond the academic classroom into a world where MEMS devices are of high significance — "a career-altering moment for some student engineers," says Mark.

The University of Utah's MEMS team leader and professor Ian Harvey agrees. "I can bleed all over the paper in a classroom," he says, "but that's different from being here." He gestures at the Sandia MEMS personnel and the imposing conference room, with its 30-foot-high ceiling, reserved for the team presentations. "I'm dealing with engineers early in their careers. This can make them passionate about their work."





WINNERS — The top image depicts the University of Oklahoma design for a MEMS microswimmer that mimics a human sperm's size and undulatory flagellum swimming style. The lower image depicts the Texas Tech University design for the tribogauge, which aims to provide a new dimension to the characterization and understanding of nanoscale surface-to-surface interactions in micro- and nanodevices.

The winning MEMS design contest entries

The University of Oklahoma's **microswimmer** is the first known microscale artificial swimmer capable of being produced in batches of 100 by the process known as surface micromachining — the most widespread technique used worldwide to fabricate micromachines, and in which Sandia's facility is a leader. The swimmer's free-swinging tail — 40 micrometers in length — is roughly the length of a human sperm. The different rates of expansion and contraction of a tail strip with one side aluminum, the other polysilicon, when heated by a cyclically powered microwave, set the tail wagging, propelling the swimmer forward at an average speed of 3.3 micrometers/second. Potential applications include research and drug delivery in the body.

The **tribogauge** design uses comb drives — interlaid sets of "teeth" that, when electrically charged, attract each other. These normally are used to drive rods that power microgears or latches. Texas Tech student designers propose using this device not only for power but, treating their parallel comb teeth like capacitors, as sensing devices. With this and with pads that extend off the surface of the chip, the gauge will detect wear, friction, stiction (the force needed to break an object out of its stationary position), and lubrication of various MEMS devices in situ, including those actuated by electrostatic and electrothermal means.

Increased interest

From Sandia's point of view, says Tom, the contest brings in new design ideas, provides impetus to universities to train the next generation of MEMS engineers, permits Sandia engineers the satisfaction of acting as mentors, and allows Sandia to partner on university grants from the National Science Foundation that are ordinarily closed to the national labs.

The program has drawn increased interest from universities, says Mark, perhaps because the latest flat-screen digital light processing — DLP — TVs use MEMS mirrors to switch pixel colors, and MEMS accelerometers provide key sensing elements in popular Wii game controllers.

Still, from a university's point of view in a time of cutbacks, says Harvey, "MEMS is called a boutique course. Administrators ask, 'Why don't we just teach the basics? Cover fundamentals? Train people who can find jobs?'"

Harvey says his problem with that outlook is that "a lot of kids are vacillating. They're not sure what they want to do. Instead of throwing them into a thermodynamics class, we offer a nontraditional class. There are no books or tests. Instead, there's design, simulations, continuous feedback, and talk about reliability and packaging."

"It's the machine shop of the future," says Tom, "and, here at Sandia, at the most advanced MEMS facility in the world, we have the personnel to help alliance members through problems. But a university has to make a significant investment in tools and education to get its program going."

The alliance helps by providing classroom teaching materials and licenses for Sandia's design tools at a very reasonable cost. This makes it possible for a university without its own fabrication facilities to develop a curriculum in MEMS.

No instant gratification here

Contest participation is the opposite of instant gratification. The entire 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 MESA fabrication facility then creates parts for each of the entrants. Once the parts are fabricated, they're shipped back to the university students for lengthy tests to determine whether the final product matches the purpose of the original computer simulation.

Among factors of continual interest to MEMS fabricators and designers are friction, stiction, temperature, humidity, and surface topography.

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.

Royalty awards

(Continued from page 1)

in a case or two, the $150,000 cap has been reached," Mark says. "It's a nice perk."

A recap of the royalty distribution for FY08 licensing revenues follows:

- $747,000 distributed to 261 New Mexico and California awardees. The largest single payment was $150,000.
- $2,308,000 distributed to five divisions and then subsequently to the centers within each division.
- $343,702 distributed under the "significant contributors" incentive portion of the Royalty Sharing Program. This included $210,702 awarded to individual employees and contract employees nominated by the inventors/authors of the licensed intellectual property associated with those licenses that brought in royalty revenues in FY08. Another $133,000 went to 105 Sandia employees, as nominated by executive management, for their contribution as inventors of significant classified noncommercial technologies.

Royalty distribution

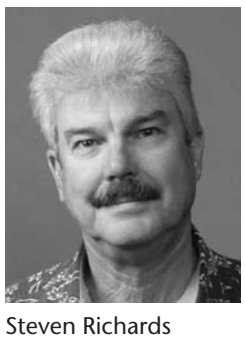
Royalties received by Sandia for licensed intellectual property are distributed as follows:

- 20 percent of royalties received are distributed as Royalty Sharing Program inventor/author awards to the intellectual property inventors and authors (employees and former employees only) for past creative endeavors. The awards are distributed in December for royalties received during the previous fiscal year.
- 65 percent of royalties received are distributed as Royalty Sharing Program division awards to the division responsible for the future application of the technology for the benefit of DOE missions. These funds are distributed in January for royalties received during the previous fiscal year.
- 10 percent of royalties received are distributed as Royalty Sharing Program contributor/classified inventor awards to contributors in the development and/or deployment of the intellectual property and developers of significant classified noncommercial technologies. They are distributed in January for royalties received during the previous fiscal year.
- 5 percent of royalties received are used for intellectual property management expenditures such as maintenance fee payments.

For details, see http://ln.sandia.gov/royalty-sharing.

Mileposts

New Mexico photos by Michelle Fleming
California photos by Randy Wong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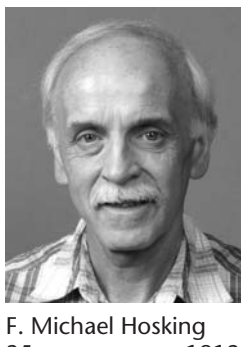
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Alan Mahoney
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Recent Retiree


Clyde Layne
29 5920


Phillip Forbes
25 5919


Nathan Golden
25 1031


Robert Kipp
25 2611


Dennis Roach
25 6416


David Schultz
25 2138


Edward Walsh
25 8964


Debra Browitt
20 2717


Pamela Catanach
20 3652


Joy Lynn Giron
20 6414


Tracy Jones
20 9542


Mary Klein
20 2


Randy Lober
20 5533


Stephen Lott
20 5572


Jane Carroll Marbach
20 3330


Vanessa Mills
20 2951


Kari Neely
20 8514


Patrick Ortiz
20 4826


Art Brito
15 5763


Dahlon Chu
15 1730


Danny Maccallum
15 1813


Norman Smith
15 5624

This month in the past

50 years ago . . . Keeping people well is the assigned task for the Sandia Medical staff. The mission of Sandia's Medical program is to conserve, improve and maintain employees' physical and emotional health through preventive medicine. Dr. Sheldon Bliss, Medical Director, says his organization's aim is to "to keep people well and on the job." There were 61,395 professional calls made to the organization in the previous year. The great majority of these visits were in the non-occupational category, calls for treatment of minor ailments such as colds, flu and headaches.


ALLERGY INJECTION is administered as part of the service of the Medical organization 4900.

40 years ago . . . The New Mexico Air National Guard returned home after a year of deployment to Vietnam. Among those Guardsmen returning from active duty were 30 Sandians. **A telemetry assembly was developed** to monitor about 50 functions during flight tests to determine how well systems operated. The assembly was used in AEC/DoD programs of post development testing.


WELCOME HOME – Joe Mahboub (right) and Lt. Dick Rogers (left) were among 30 Sandians returning home from Vietnam.

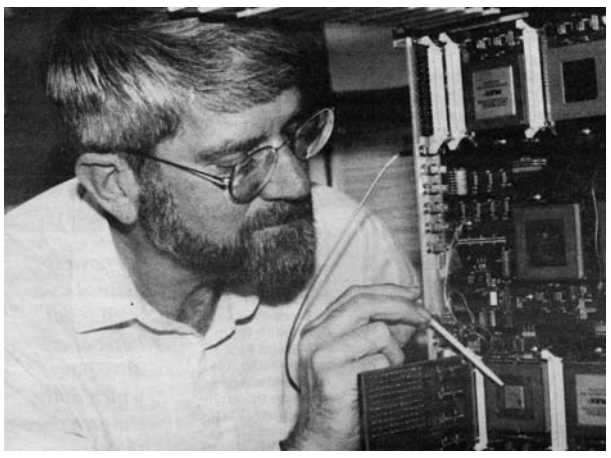

Robert Strout (left) and Larry Humphreys (both 8181) check the telemetry assembly that was developed by them for systems operations during flight tests.

30 years ago . . . Efficiency and electrical output of **Sandia's large vertical axis wind turbine (VAWT)** have been increased by using new blades constructed of extruded aluminum. The blades, fabricated by Alcoa, are expected to help make such turbines competitive sources of energy in many areas of high wind.

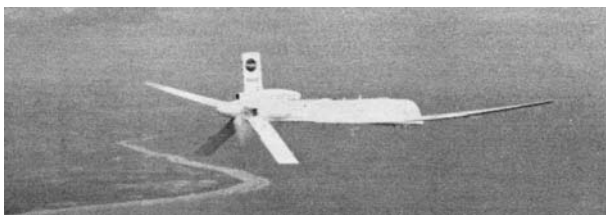
20 years ago . . . The Photovoltaic Device Fabrication Laboratory (PDFL) was dedicated, marking a new phase in Sandia's photovoltaic research activities. The immediate goal of the laboratory was to demonstrate the ability to sustain a precisely controlled, quality processing environment in which one-sun cells with efficiencies exceeding 20 percent could be routinely fabricated.


Sheila Guynes and Bill Sullivan (both 4715) examine a cross-section of the new VAWT blade.

10 years ago . . . The world's fastest encryption device, developed at Sandia, which encrypts data at more than 6.7 billion bits per second — 10 times faster than any other known encryptor — may be soon protecting data being transmitted from supercomputers, workstations, telephones, and video terminals.


LYNDON PIERSON points to the unclassified encryptor chip — the world's fastest encryption device — that his research team designed. (Photo by Chris Burroughs)

A series of scientific flights with a remotely piloted aircraft above the ocean near Kauai have probed how clouds affect global warming, serving as a warm-up act for studies in the birthplace of tropical storms.


THE ALTUS FLIES near the Kauai coastline during the ARM-UAV mission to study the role of clouds in global climate change. (Photo by Dick Jones)

Sandia to cease most Machine Shop operations at New Mexico site

After more than 60 years, Sandia has decided to cease most of its Machine Shop operations in New Mexico. In arriving at the decision, senior management cited the declining need for specialized machining services and the high cost of maintaining an in-house capability.

The closure impacts about 100 New Mexico employees. Sandia executive management says Sandia will make every reasonable effort to place affected employees in other positions at the Laboratories.

Sandia management made the announcement to employees on Tuesday.

The decision to close the machine shop operations came after careful analysis determined it was no longer economically feasible to continue the majority of machining and mechanical measurement operations at Sandia's New Mexico site. Machining operations will continue at Sandia's site in Livermore, Calif.

Sandia will retain some Machine Shop capabilities: hardware demilitarization, explosive machining, calibration, and manufacturing liaison. In addition, Sandia will maintain some mechanical measurement capability at the New Mexico site to support manufacturing liaison.

Most of the jobs supporting machining and mechanical measurement operations will be eliminated over the next six to 12 months. The exact timeframe needed to implement the changes will depend on the short-term funding for the Machine Shop and the time needed to transition the remaining work to outside machine shops.

According to the executive communication distributed to employees, the transition of Machine Shop personnel will be gradual, but the transition process will begin immediately.

During the transition, the Machine Shop will continue to take on new jobs that are consistent with the Laboratories' changing capability. Sandia will honor all of its commitments to existing customers.

Sandia's Machine Shop has been in existence since the Labs' beginnings during the Manhattan Project in 1945. A primary task of the Machine Shop has been the machining of precision components for weapons.

SANDIA'S MACHINE SHOP during Family Day 1959. Sandia announced this week that most Machine Shop operations will cease over the next six to 12 months.

Sandia's Rapunzels share their strength with those in need

By Iris Aboytes

Many of us have read different versions of Samson and his incredible strength attributed to his long hair. Once Delilah had his head shaved, he was not as strong. This is similar to what cancer patients experience as their hair disappears when chemotherapy tries to rid their bodies of their powerful enemy.

Unlike Samson, who had to wait for his hair to grow to regain his strength and conquer his enemies, cancer patients can look to caring souls who step in to try to repair some of the harm rendered by their adversary. Wigs are made from donated hair to help cancer patients regain their self-esteem while their own hair returns to its original beauty.

DIANA PEREA

"It was a little traumatic for me to have my hair cut the first time," says Diana Perea (9336). "I had always worn my hair long. I would get it trimmed to keep it healthy."

Diana is one of several women at Sandia who donate their hair for wigs.

"My daughter Lisa inspired me to donate it," says Diana. "I mentioned to her that I wanted to get my hair cut. She asked if I wanted to give it to Locks of Love. We went to get our hair cut together the first time. The second time, Lisa, my granddaughter Elisia, who was 10 years old at the time, and I all went together to get our hair cut. This time Lisa and I will go together."

"It has hit closer to the workplace," adds Diana. "I have several coworkers who have had treatments for cancer. My coworker Dixie Chavez, who has since retired, lost all her hair due to chemotherapy. She probably influenced me the most because she used to wear scarves around her head, and here I had all this hair. I just wanted to cut it off and give it to her."

"I had my hair cut and donated it in the early 1990s and twice since then," says Bev Silva (1717). "The last two donations, I had more of an incentive. My sister Maria is battling cancer and is balding. Who would have known when I first donated my hair that there would a need for my hair in my own family."

Bev's nieces, 10-year-old Athelin and five-year-old Camille, also had their hair cut. "I decided I would like my hair short," says Athelin. "I got goose bumps as I thought it would be great if my hair would be made into a wig for my Aunt Maria."

"My hair used to tangle when it was long," says Camille. "Now it is short and it is easy to comb. It was good to give it away. My aunt Bev donates her hair too."

"It is very simple," says Bev. "The hairdresser puts your hair in a ponytail and cuts it. She then continues as she styles your hair how you prefer. It doesn't take long for it to grow again. Mine takes about two years to reach the desired length, anywhere from eight to 12 inches.

"I was told that usually any beauty salon can cut your hair for donation as long as you tell them in advance," adds Bev. "The hairdressers have the paperwork for you to fill out. They do not let the hair touch the ground."

"Sometimes if I notice a woman wearing a wig," says Diana, "I wonder if it was my hair. The best part is that cancer patients do not have to pay for the wigs, they are free. It is really cool."

"It made me feel awesome," says Sally Samora (1725). "My mother had cancer. It made me feel good to help somebody else's family. For me, it's like I have been full circle."

"What I'm doing is minor," says Diana. "The real heroes are those who battle cancer. I am glad that my hair can be used to make wigs. Many people donate money. That is good. I am giving me — a personal part of me."

As Samson crushed a temple full of Philistine leaders once his hair grew out, hair donors hope to help crush the Philistines (cancers) of today — or at least ease the pain they cause.

These are some of the agencies that accept donated hair. Information is abundant on the Internet.

Locks of Love is a charity organization that provides hairpieces to financially disadvantaged children under the age of 18 with medical hair loss. Hair may be colored or permed, but not chemically damaged, and must have a minimum length of 10 inches.

Angel Hair for Kids is a Canada-based organization that provides kids with wigs made of real and synthetic hair. The wigs are custom made from 10 to 12 ponytails. They will even visit the child if he or she can't go in for the wig fitting because of the illness.

Pantene Beautiful Lengths' requirements are not as high as some of the other organizations. Hair only has to be eight inches long.

Lynne Adams receives ISM Education/Learning Person of the Year Award

Lynne Adams (10221) was recently honored with the ISM's (Institute for Supply Management) 2008 Education/Learning Person of the Year at the 94th Annual International Supply Management Conference and Educational Exhibit in early May in Charlotte, N.C.

Lynne's award highlights her support of educational opportunities. She serves as the certification chair for NAPM (National Association of Purchasing Management) — New Mexico Inc. The award citation reads, "She is admired for being a great motivator and for the enthusiasm she shares while encouraging candidates who are pursuing certification, mentoring students, and striving to provide variety programming."

LYNNE ADAMS

Lynne provides certification classes enabling supply chain professionals to become certified.

"I feel humbled to receive this award for something I am committed to and love doing," says Lynne. "Teaching the class participants keeps my own knowledge constantly fresh."

"Lynne is dedicated to lifelong learning," says Nora Armijo (10221). "She makes learning fun and interesting as she engages her students. She devotes countless hours to the classes for a positive student experience. She is passionate about learning and teaching others. When Lynne commits, you can expect outstanding results because of her high standards.

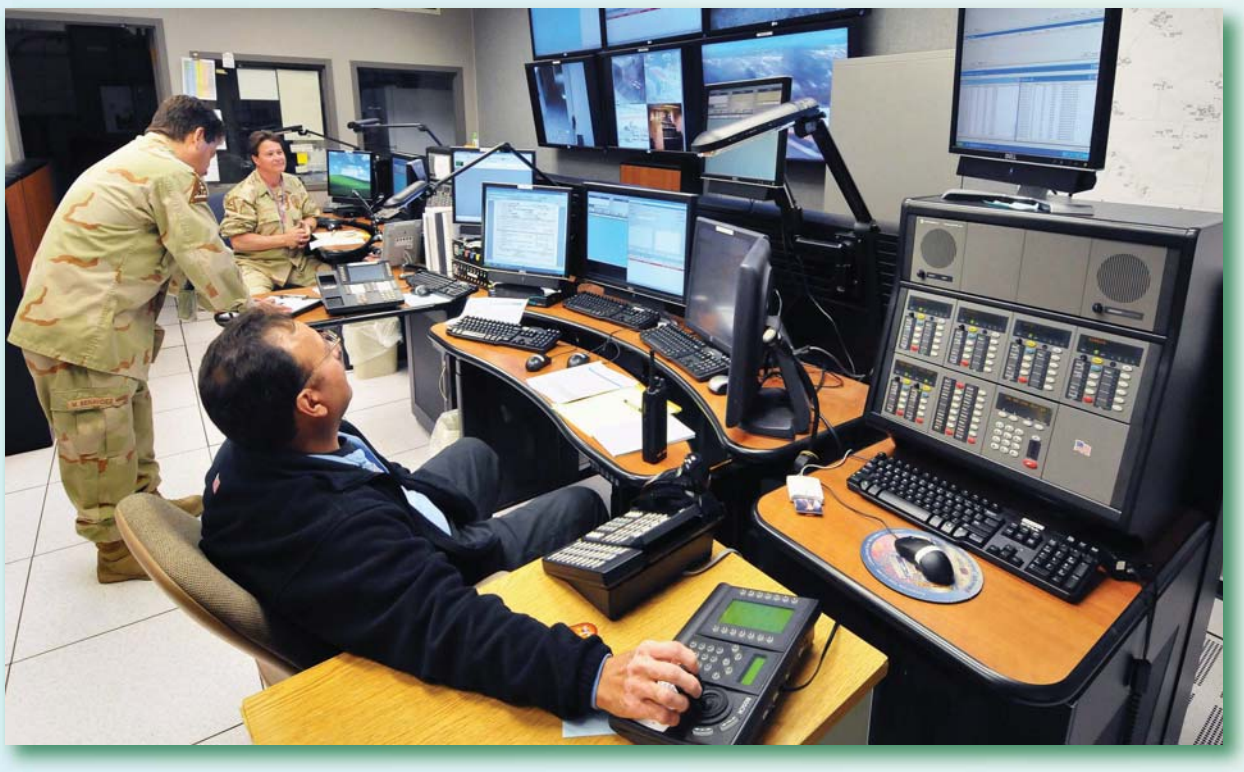
"She has earned this competitive and international Person of the Year award because of her dedication, recognized locally and at the ISM."

Lynne has participated in ISM's Certified Professional in Supply Management pilot testing and was among the first to earn the CPSM certificate.

Awards are not new to Lynne. She received the NAPM-NM Jay Hughes Award in 2008 for her many contributions and leadership.

The Institute for Supply Management was founded in 1915 and is the largest supply management association in the world. ISM, headquartered in Arizona, is a nonprofit association that provides opportunities for the promotion of the profession and the expansion of professional skills and knowledge. *— Iris Aboytes*

Sandia Security: Ever-vigilant, ever-ready



24/7 SECURITY MONITORING — A Sandia security team, two hours into the graveyard shift in the North Central Alarm Station, makes sure Sandia stays safe and secure. In the May 22 issue of the *Lab News* a photo caption misstated that the Labs' Emergency Operations Center monitors the security alarms. That assignment is carried out 365 days a year by members of Sandia's Protective Force. Pictured above, front to back, are Ernest Torres (4211) monitoring alarm systems, Mike Benavidez (4211) conducting 911 line checks, and Charles Aragon (4211) monitoring communications and checking security monitors. (Photo by Randy Montoya)