

Bio threats call for new global collaboration model

SANDIA'S REN SALERNO, global expert on biological threat reduction, gestures before an enlarged illustration of molecules that have come to signify biological threats. Ren is championing efforts to gain greater recognition for Sandia's Countering Biological Threats programs, which provide the science, technology, and technical policy solutions for confronting on a global scale the entire lifecycle of a biological threat. (Photo by Randy Montoya)

By Renee Deger

Senior Manager Ren Salerno (6820) took the podium during a recent biosecurity conference to begin writing a new chapter on global collaboration initiatives aimed at solving US national security challenges, particularly those posed by biological threats.

Ren unveiled a new collaboration model at Biosecurity 2011, a series of targeted breakout sessions staged during June's 2011 BIO International Convention in Washington, D.C. The new approach would evolve many existing relationships that Sandia has with life sciences organizations worldwide into more strategic and technical development initiatives.

"Our national security used to be our problem alone, and — internationally — it was up to us to create unilateral arrangements or bilateral agreements to extend our resources into other countries and to work with them to implement our solutions," Ren says. "But the threats today are increasing and becoming more complex as dual-use materials, technologies, and expertise propagate all over the world. We're moving into an era of collaboration that must foster new solutions, new stakeholders and ultimately, new partners who will help us defend our security by strengthening their own."

New 'Countering Biological Threats'

During his presentation, Ren emphasized how targeted collaborations aimed at building solutions appropriate to local environments will become integral to mitigating biological threats. The seeds for such an approach have already been sown through Sandia's International Biological Threat Reduction (IBTR) activities. The IBTR program is the international component of what Sandia recently began calling its Countering

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Biological Threats (CBT) programs.

The CBT programs comprise multiple capabilities and programs from throughout the Labs that combined confront all of the elements of the biological threat lifecycle — from awareness to prevention, preparedness to detection, and response to recovery. By grouping this collection under a single umbrella, Sandia can better illustrate its broad reach across the entire biological threat spectrum.

Leading the charge to strengthen Sandia's identity in

this area is Ren, who heads Cooperative Threat Reduction efforts within Global Security, a major component of the International, Homeland, and Nuclear Security strategic management unit. Senior Manager Duane Lindner (8120), who is the program manager for Sandia's Chem/Bio National Security program, is also playing a key role in establishing greater recognition for Sandia's CBT programs.

"We've developed a large number of technologies and tools for disease surveillance, agent detection, response,

(Continued on page 6)

Way cool: Sandia's 'Cooler' technology offers breakthrough in heat transfer for microelectronics

By Mike Janes

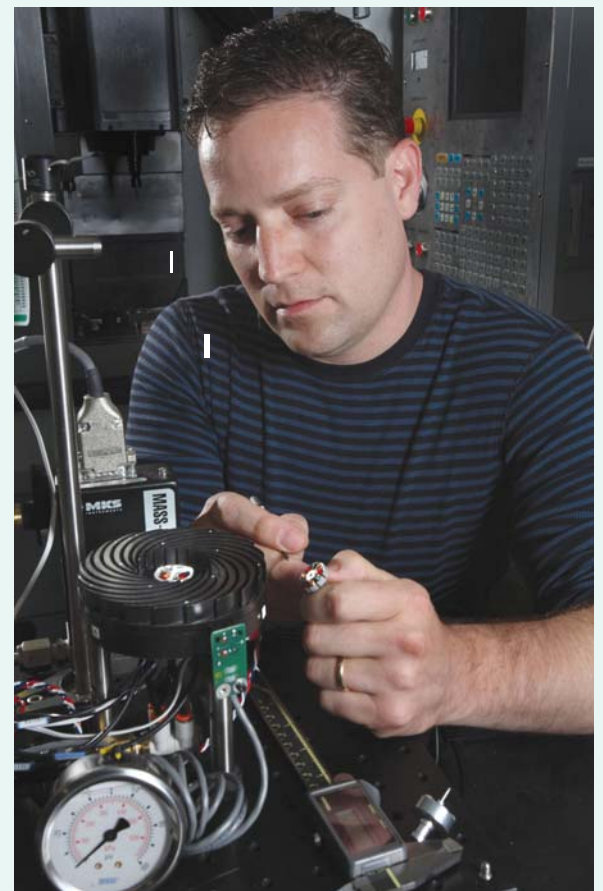
A Sandia researcher has developed a new technology with the potential to dramatically alter the air-cooling landscape in computing. Sandia is now seeking partners in the electronics chip cooling field to license and commercialize the device.

The "Sandia Cooler," also known as the "Air Bearing Heat Exchanger," is a novel, proprietary air-cooling invention developed by Jeff Koplow (8365), who was recently selected by the National Academy of Engineering (NAE) to take part in NAE's 17th annual US Frontiers of Engineering symposium.

Jeff says the Sandia Cooler technology, which is patent pending, will significantly reduce the energy needed to cool the processor chips in data centers and large-scale computing environments. The yearly electricity bill paid by the information technology sector in the US is currently on the order of \$7 billion and continues to grow.

In a conventional CPU cooler, the heat transfer
(Continued on page 3)

MR. COOL — Sandia's Jeff Koplow makes an adjustment to an earlier prototype of his Air Bearing Heat Exchanger invention. The technology, known as the "Sandia Cooler," significantly reduces the energy needed to cool the processor chips in data centers and large-scale computing environments. (Photo by Dino Vournas)



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That's that

Note: Las News writer Iris Aboytes fills in with a That's that column this week for editor Bill Murphy, who was on vacation.

Every fall, many of us make our yearly pilgrimage to Dixon Apple Farms. Located between Albuquerque and Santa Fe near Cochiti Canyon, Dixon is known for its scrumptious apples. Waiting in line doesn't seem an inconvenience as we anticipate the first bite of the golden champagnes. This year, the Las Conchas Fire has seriously damaged the orchard: 300 trees and some of the farm's equipment have been destroyed.

The orchard was started by Fred Dixon in 1944. He nurtured the farm for more than 40 years. When his granddaughter Becky was 18, she moved to New Mexico to learn all about the apple business. Fred taught Becky all he knew. Recognizing the love and devotion Becky had for the farm, Fred turned it over to her and her husband, Jim Mullane, in 1996.

In a KOAT-TV interview Jim Mullane said, "I thought I was going to fight this [fire], but it was like an animal coming down this mountain." Becky told KOAT they still are hoping to harvest what they have.

Let's hope the Mullanes can restore their orchard to its original glory. Let's also hope that our other neighbors who were affected by the fire have strength and courage to weather their storm. For our Native American neighbors and neighbors to the north, let's hope they are spared any more of the fire's fury. And finally, let's pray for rain.

* * *

The Lab News staff was recently notified by Writing that Works (APEX) that the Lab News received a Grand Award for publication excellence. The competition included 3,300 entries in 11 categories. Only 100 Grand Awards were presented. The Lab News staff also won APEX excellence awards in publication design and layout, the IED water disruptor media campaign, science/technology writing, photography, and writing series.

It's great when you love what you do and then are rewarded for it. As humbled as we are receiving these awards, we realize that our real rewards come from you, our readers, who read what we write and admire the photos we publish.

* * *

My 11-year-old grandson, CJ, is competing in the Rio Arriba County Fair again this year. He is showing three pigs, named Pumba, Gaga, and Tido, and a steer named Felix. But how things change! When I was growing up, my family used to have pigs. We fed them our leftovers along with lots of corn and grain. CJ's pigs eat MoorMan's ShowTec show feed products (definitely not leftovers). His year-old Maine-cross steer gets fed pro beef cattle ration. I confess I am not an expert judge in this area, but I do know pigs and steers, and I know CJ has the winning entry in each division.

CJ's nearly 8-year-old brother, Alex, can't show animals yet, but still practices every day with Pepper, his gray quarter horse. Alex loves being a cowboy. He is a roper at heart and ropes everything in his way, including his 5-year-old brother, Jhett. You recognize Alex wherever he goes. He is always wearing boots and his cowboy hat.

When Jhett isn't being roped by Alex, he is helping CJ give Felix a bath or exercising his pigs. Knowing showmanship is part of showing, Jhett does it all with a king-size smile.

There's a lot of excitement at football games (go Cowboys!), and basketball games (go Lobos!), and soccer (go Mackie and Maddie!), but this is the county fair; the experience is totally different. Attendees get the hands-on excitement of the experience. Pen after pen, you learn from teachers who are less than four feet tall as your boots get full of mud and you become an expert on whatever animal you see.

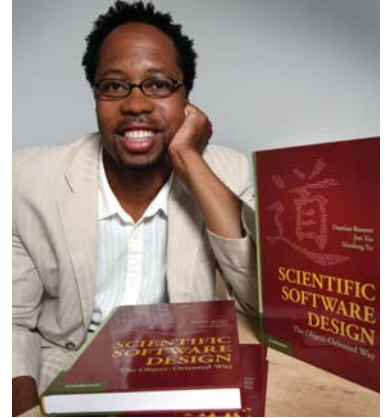
Soon you become captivated by the entire adventure. You enjoy the mud, different animal noises, and families roaming around. It's about hard work and family. Oh, and besides family, the best part of county fairs is the hamburgers. They might not be 98 percent fat-free, but they are to die for. I can hardly wait.

— Iris Aboytes, (505-844-2282, MS 0165, ioaboigt@sandia.gov)

Of blackboards and computer screens: Scientific programming in the 21st century

By Karen McWilliams

Since he was a college student, Damian Rouson (8351) has been fascinated by the intersection of science and computing. Computers have transformed scientific research, yet the fields still exist on separate planes. He takes on the challenge of rendering computer languages, so vital to scientific advancements, more expressive and easier to read in a new book, *Scientific Software Design: The Object-Oriented Way*, published by Cambridge University Press this spring.



DAMIAN ROUSON

Everyone is familiar with old black-and-white photographs of physicists working out difficult theories at a blackboard. To the layperson, those cryptic equations strewn across the board look like gibberish, but to fellow scientists it is a perfectly understandable code.

The 21st century equivalent of the blackboard could be the computer screens that are so much a part of today's world. However, the mathematical symbols in common use 50 years ago have given way to incredibly complex computer languages that often look like gibberish even to fellow scientists. Most computer languages such as Fortran and C++ are not expressive: Code written in these languages is hard to decipher even among fellow researchers.

"This book comes out of my experience as a graduate student 15 years ago," Damian says. "I took a class in software engineering from the computer science department, and none of the examples used in the class had any relationship to science. By contrast, if you take scientists, even those who are computationally oriented, they really don't talk about the writing of the program. They talk about the mathematical algorithms and it's assumed that the translation of the basic algorithm into code — into a program — is straightforward and doesn't deserve much discussion. They don't get down to the practices for writing the code."

Familiar expressions

The expressive style of programming outlined in Damian's book provides a way to shorten the development time dramatically, because researchers can use familiar expressions — what they'd write on a blackboard.

As a visiting faculty member at the University of Cyprus in the fall of 2006, Damian taught a course on scientific software design that eventually formed the basis of this book. Writing the book was straightforward, but issues surrounding the computer languages proved more difficult.

"A lot of the Fortran language features we use today weren't available five years ago, when I started writing," Damian notes. Initial reviews from the publisher indicated that the book would have far more lasting value if it used the recently released Fortran 2003 instead of the more commonly used Fortran 95.

This necessary adaptation proved the biggest challenge in the whole project — finding a compiler that could translate the high-level code added another year's worth of work. Damian drew upon the expertise of coauthors Jim Xia (IBM Canada Lab in Markham) and Xiaofeng Xu (General Motors Corp.) to attune the material to Fortran 2003. Jim is on IBM's XL compiler test team and on the international Fortran language standards committee.

With this book, Damian says, "the idea is to go behind the curtain and see how, by using some nice features of modern programming languages, you can give your own code the same level of expressiveness that is currently attainable with some proprietary solutions, but do so in a more open, scalable manner."

Now that the book is published, Damian is moving into a new phase of research. The first was developing the style of programming itself. The second was demonstrating that it can produce publishable science — in other words, papers that focus on the science, not the code. "This third phase is showing that we can get it to scale, that we can write, not just pretty code, but fast code, and that some of what makes it pretty also makes it fast," he says.

Now, coming full circle, Damian has returned as a visiting professor to the University of Cyprus (while still remaining a manager in Center 8300) to begin putting together what should be the first truly scalable demonstration of this programming style. "Ideally, this visit will demonstrate the ability to run problems that matter to scientists, on systems that matter, in a national lab-type setting," he says.



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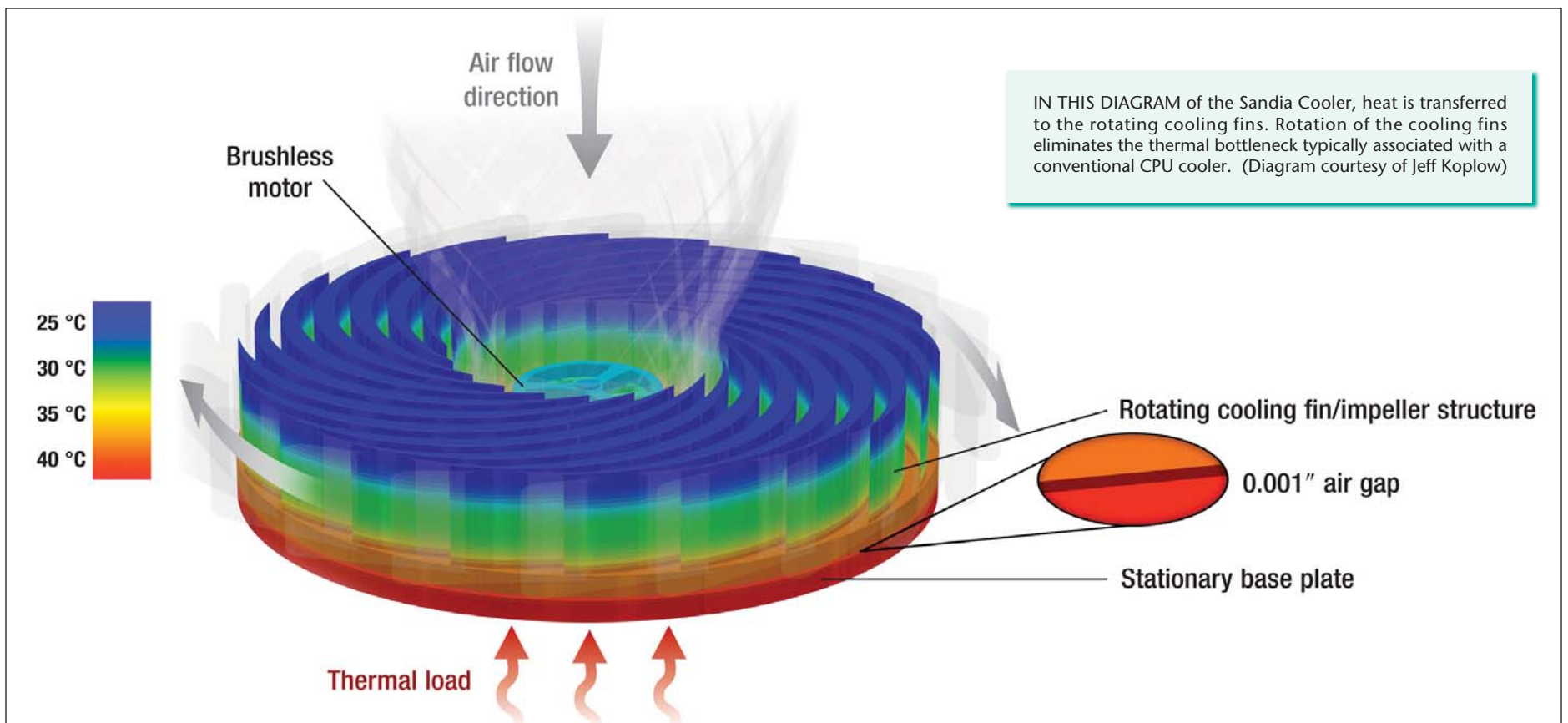
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Cool tech

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bottleneck is the boundary layer of "dead air" that clings to the cooling fins. With the Sandia Cooler, heat is efficiently transferred across a narrow air gap from a stationary base to a rotating structure. The normally stagnant boundary layer of air enveloping the cooling fins is subjected to a powerful centrifugal pumping effect, causing the boundary layer thickness to be reduced to 10 times thinner than normal. This reduction enables a dramatic improvement in cooling performance within a much smaller package.

Additionally, the high-speed rotation of the heat exchanger fins minimizes the problem of heat exchanger fouling. The way the redesigned cooling fins slice through the air greatly improves aerodynamic efficiency, which translates to extremely quiet operation. The Sandia Cooler's benefits have been verified by lab researchers on a proof-of-concept prototype approximately sized to cool

computer CPUs. The technology, Jeff says, also shows great potential for personal computer applications.

Broader energy sector applications

The Sandia Cooler also offers benefits in other applications where thermal management and energy efficiency are important, particularly heating, ventilation, and air-conditioning (HVAC). Jeff says that if Air Bearing Heat Exchanger technology proves amenable to size scaling, it has the potential to decrease overall electrical power consumption in the US by more than 7 percent.

Sandia is currently engaged in discussions with companies that have expressed interest in licensing the Sandia Cooler. The Labs will soon establish a separate process for exploring partnering and/or licensing opportunities in fields other than electronics chip cooling.

Sandia's work on the cooler technology was funded initially through internal investments. Follow-on funding is also being provided by the Department of Energy's Building Technologies Program within the Office of Energy Efficiency and Renewable Energy (EERE).

Sandia California News

California Lt. Gov. Gavin Newsom visits Sandia/California for briefing on emerging energy research



LAST MONTH, California Lt. Gov. Gavin Newsom visited Sandia/California to learn about current and emerging energy research at the site. Hosted by Div. 8000 VP Rick Stulen, Newsom learned about Sandia's advanced modeling and simulation capabilities, research into advanced engine design, cybersecurity work, and the site's economic impact on the state of California. In the photo at top right, Rick explains how modeling and simulation work enabled by the Combustion Research Computation and Visualization building is helping advance engine design. At right, Center 8300 Director Bob Carling discusses the capabilities of the Combustion Research Facility. In the photo above, Chuck Mueller shows the lieutenant governor a high-speed movie of a new fuel-injection strategy. The movie was acquired through a window in the cylinder of an optically accessible compression-ignition engine. (Photos by Randy Wong)



WE FIGHT FIRE THIS TIME

Sandia lends a hand to Las Conchas Fire monitoring, evacuees

Story by Heather Clark

Northern New Mexicans living in areas near the Las Conchas Fire can breathe a little easier thanks to NNSA Radiological Assistance Program (RAP) team members from Sandia who helped monitor air quality in northern New Mexico.

So far, the samples collected by the RAP team have revealed no elevated hazardous contaminants or radioactive materials in the smoky air and are not expected to indicate there were any problems, says the team's captain, Hans Oldewage (2917).

"I think it's an important part of the response to the fire," Hans says. "The primary service we're providing is a demonstration that there was no release. Without the monitoring, there might be a question about whether or not that occurred."

The RAP team members were among several Sandia organizations and employees that helped Los Alamos National Laboratory (LANL) and the community during the wildfire, which had grown to almost 150,000 acres and was 50 percent contained by *Lab News* press time.

Sandia also provided the following:

- Logistics Operations (10260) and Corporate Storage (10263-1) accepted a radioactive shipment from a truck that was en route to Los Alamos when the wildfire broke out, says manager Catherine Green (10263). Catherine says employees coordinated with security to get the truck on base and understand any consequences of storing the material here.

- Sandia's HPC OneStop User Support team (9326 and 9328) provides support for the Cielo supercomputer that is run jointly with LANL, and gave added help when the supercomputer was shut down due to the fire. Sandia employees continued some Alliance for Computing at Extreme Scale activities, kept the help desk running for users at Sandia, Los Alamos, and Livermore labs, and kept them informed during the closure, Karen Haskell (9326) says.

- Three specialists from Media Relations and Communications Dept. 3601 worked in Los Alamos' Joint Information Center in Santa Fe, providing information to reporters, addressing and dispelling rumors and misinformation, and sending out news releases.

- Denise Bleakly, a geographic information system (GIS) analyst at Sandia, assisted the DOE Headquarters Emergency Operations Center (EOC) by contacting New Mexico state and local agencies for current imagery and map data for the area of the Las Conchas Fire. She helped connect DOE to web mapping services hosted by state agencies and put them in contact with the Los Alamos County GIS coordinator, who provided a current building footprint map. This geospatial information was used by DOE to monitor the progress of the fire relative to LANL's property.

Sandia employees also asked how they personally could help, says Pam Catanach (3652), who encouraged them to donate to emergency-relief organizations, such as the American Red Cross.

"Sandians are very generous and are always looking for ways to help others. Based on our experience with past disasters, we direct them to agencies that have the capacity to deal efficiently with disasters," Pam says.

In addition to individual donations, Lockheed Martin Corp. also gave \$10,000 in Sandia's name to the American Red Cross to support all the families displaced by all fires in New Mexico, she says.

Traveling to Los Alamos on Tuesday, June 28, for the RAP team were Hans, Kevin Rolfe (1522), Mike Torneby (1387), Gary Baldonado (4136-1), and Jim Keagy (4128). They were joined by four RAP team members from the Pantex Plant near Amarillo, Texas, members of the Los Alamos Site Office and NNSA's NA-42, and several Los



Alamos RAP team members who supported their work, Hans says.

NNSA RAP teams provide assistance for all sorts of radiological incidents, including responding to facility or transportation accidents, providing technical advice by telephone, or sending state-of-the-art equipment to identify possible radiological hazards.

For the Las Conchas Fire, the team supported Los Alamos lab's own extensive air monitoring network by placing additional air monitors at sites requested by the New Mexico Environment Department in Taos, Dixon, Embudo, El Valle, Chimayo, and Las Vegas, N.M.

Jim and Mike also went to the Donaldson Complex Fire near Ruidoso to sample the air there to compare it to the results from the Las Conchas Fire monitoring.

"There are naturally occurring radioactive materials that are released from the vegetation and from extra heating of the ground," Hans says. "You can't make a direct comparison, but you can at least show that at a fire far away from Los Alamos, this phenomenon also occurs."

The RAP air monitors are equipped with high-efficiency filters to collect particulate matter. They were set up at libraries, fire stations, and residences, including the home of a member of an environmental group called the Embudo Valley Environmental Monitoring Group in the remote community of El Valle, Hans and Kevin say.

Kevin says environmental groups had input about where to place the air monitors and curious onlookers watched when they were setting up equipment in some towns.

The filters were changed daily and sent to LANL and an independent laboratory in Colorado for testing, Hans says.

The team removed the air monitors on Tuesday, July 5, as it became clear the fire would not burn farther onto LANL property.

Kevin and Hans say the response to the Las Conchas Fire was more easily coordinated probably due to the experience gained during the Cerro Grande Fire that burned parts of Los Alamos 11 years ago.

"We were in place in advance and actually incorporated into some planning pretty early on. The response to this fire was more organized among the state, the Environmental Protection Agency, and DOE," Hans says.

And Kevin, who also responded to the Cerro Grande Fire, says: "We were more efficient this time. We knew the sampling that we were going to be doing."

Hans and Kevin say there's another group of Sandians who should not be forgotten when talking about support lent to the Las Conchas Fire. They thanked the managers and co-workers who covered for the absent team members during the massive wildfire.

—Stephanie Holinka contributed to this report.

• Photos by Randy Montoya •



LAS CONCHAS fire from space. (Photo courtesy of NASA)





Las Conchas Fire through the eyes of a Sandia photographer

Story by *Stephanie Hobby*

New Mexico was in the midst of a reprieve from the eastward-charging Wallow Fire smoke, but just as firefighters were taking control of Arizona's largest wildfire on record, flames in the Santa Fe National Forest were getting ready to make their own history in New Mexico.

On June 26, a large pillar of smoke rising to Albuquerque's north was the first indication that this fire was going to be a big one. Sandia *Lab News* photographer Randy Montoya, along with his wife, Catherine, and daughter Amanda, went there to evacuate his mother, Lorenza Montoya, pack up a few mementos from a life lived in Los Alamos, and potentially say good-bye to his childhood home, where his mother has lived for the past 45 years. With camera in hand, he documented the exodus, and seven tense days later, the repopulation of the town.

"I'm very proud of the behavior of that little town and how it behaved under heavy stress," Randy wrote in an email once his family was safely in Albuquerque. "It was worse this time because it was no longer theory of catastrophe to us — we'd seen devastation here before."

Thoughts of the Cerro Grande Fire, which destroyed the homes of more than 400 families and caused more than a billion dollars in damage to the town, loomed heavily over the evacuees, who didn't know if they'd see their homes again. Those memories, so firmly seared in the minds of Los Alamos residents, were impossible to ignore as firefighters raced to hold back the flames.

"My mother, who is the most level-headed person at 92 years old, was ready with medications, clothes, important papers, and photos in 30 minutes," Randy says. "My oldest sister was impressed, but my mother replied that this was the fourth time she — and her neighbors — had been evacuated, and that at least it wasn't the Cuban Missile Crisis."

After checking on friends and neighbors to make sure everyone was safe and able to evacuate, Randy and his family joined the long line of cars snaking off The Hill. They sat in traffic for 45 minutes, an unheard of wait in the town of 12,000. But Randy says law enforcement and firefighters were helpful and calm, and someone in the car ahead of him was passing bottles of water

to those directing traffic. "It's a little town — everyone knows each other. Neighbors were taking care of each other and offering any extra room in their trunks for others' belongings. They really knew the potential for what was coming, and there was much less panic than you might think," Randy says. "It was extraordinarily impressive."

The week was full of nervously watching press conferences, checking on friends, and looking for diversions to fill the agonizing hours between briefings. Once the winds turned and the evacuation orders were lifted,

Randy's family — along with every other displaced Los Alamos family — headed back up The Hill, and were greeted with a "Welcome Home" road sign.

"It was a very tentative attitude about going back. Everyone was very appreciative of the efforts of those who were fighting the fire, the National Guard, and law enforcement," Randy says. "What struck me was that every National Guard member we thanked said how honored they were to serve this town. They said they were grateful for the role this community played to protect this country, and they were glad to return the favor."

"I can't say enough about the people who fought the fire, the officials and reporters who gave us timely, accurate information, and the residents who calmly left everything behind. Even though tragedy was averted in Los Alamos, Chief Tucker (of the Los Alamos County Fire Dept.) kept talking about those who had lost their homes. It was out of his jurisdiction, but that's how people there are — just trying to look out for their neighbors."



LAB NEWS photographer Randy Montoya with his mother, Lorenza, in this photo from 2009.

(Photo by Laura Montoya)

Bio threats

(Continued from page 1)

and recovery but primarily for domestic use," says Duane. "Now we've begun to examine, and our sponsors have too, how to apply those capabilities to meet needs internationally. That means working very closely with public health officials in other nations and local scientific communities on the kinds of solutions that will function with their infrastructures and resources."

Expanding threats

The world's rapidly expanding population, especially in the developing world, is driving the rising demand for dual-use technologies, materials, and expertise to meet basic needs, Ren says, adding that this trend has created a more complex and challenging threat spectrum for national security.

"We increasingly rely on dual-use technologies to meet our basic energy, food, and public health needs," Ren says, "and with this mass proliferation of dangerous and potentially dangerous materials comes the dramatic increase in the potential that these materials could be used — accidentally or intentionally — to harm us."

The life sciences, in particular, have experienced tremendous growth as developing nations look to advanced biotechnology, including genetic engineering and synthetic biology, to produce solutions for a range of challenges, from public health to energy to agriculture. The across-the-board expansion of knowledge, materials, and equipment worldwide means more life scientists are now working in more locations with more deadly, and potentially dangerous, materials that are simpler to manipulate using basic know-how and equipment.

The *National Strategy for Countering Biological Threats*, released in late 2009, recognized the new challenges that expanding life sciences pose to national security. The strategy document stated: "Advances within the life sciences hold extraordinary potential for beneficial progress, but they also can empower those who would use biological agents for ill purpose."

This point was raised earlier in *World at Risk*, a 2008 congressional report on weapons of mass destruction and the terrorist threat, which stated more pointedly: "...the United States should be less concerned that terrorists will become biologists and far more concerned that biologists

will become terrorists. . . . [T]errorists are trying to upgrade their capabilities and could do so by recruiting skilled scientists."

The national strategy called for greater international collaboration on the issue on a number of levels. A core element of the interactions with other nations will be building the technical and intellectual capacity of professionals in specific regions so they better understand the risks, Ren says.

The next step, he adds, is working with them to develop solutions that best suit their communities. Matching solutions to local environments, Ren points out, is crucial given that developing world resources and infrastructures typically couldn't support the kinds of solutions used in the US even if it were cost effective and possible to export them.

"We can't just roll out all across the globe the kinds of technologies and systems we use here in the US," Ren says. "The new model for technical collaboration means

"We can't just roll out all across the globe the kinds of technologies and systems we use here in the US."

— Ren Salerno



helping to develop the knowledge and the technical solutions locally."

Seeds sown in Iraq

The impetus of this emerging new model of international engagement was a series of relationships that Sandia helped create between various US government agencies and a range of life sciences organizations, from private companies to public health laboratories, in a number of developing nations. The International Biological Threat Reduction program creates and maintains technical relationships with individuals who are working in life sciences facilities. A primary goal is to assist them in their efforts to operate safely and securely but also to help foster responsible attitudes about the use of life sciences and the importance of protecting dual-use materials, technologies, and expertise.

The IBTR program, with sponsorship from the US State Department, is working with one vaccine manufacturer in

Iraq, for example, to adopt new business goals and become a local supplier of much-needed pharmaceuticals and vaccines for a company based in Europe. Bottling and distributing pharmaceuticals and vaccines does not require the kinds of equipment that have a high potential for misuse, and the business model would strengthen the enterprise, helping raise salaries for scientists and making the company a stronger contributor to the community.

"The most vulnerable dual-use resource there was the people, who had managed to achieve some impressive results making vaccines with some really dated and somewhat shoddy equipment," says Melissa Finley (6822), the project's principal investigator. But upgrading and expanding the company's equipment to help make it a more productive vaccine manufacturer carried significant national security risks for Iraq, the region, and the US, Melissa says, because the apparatus can also be used to propagate and manipulate dangerous pathogens.

"We are in a unique and invaluable position to understand the technological issues, physical security needs, public health challenges, and national security risks and weigh them all when making decisions about how to approach specific programs," Melissa says. "We also go a step further by working as partners with the people who run the organizations we're working with, whether they're a private company in a very vulnerable region or a government with public health resources."

Melissa adds that the Iraqi company leadership is enthusiastic about the new opportunity Sandia is helping develop. "They're savvy business people. They understand the opportunity," she says. "And distributing vaccines in a part of the world where the pharmaceutical giants are reluctant to expand directly will dramatically improve the public and animal health of the community. They understand this as well and it's an important element to what they hope to achieve."

The next phase of global collaboration is to leverage this kind of partnership with a broader scientific community for broader purposes, Ren says.

"The next step in evolving this engagement model is to lend our technical expertise across the biological threat spectrum to partner with organizations and build a range of low-cost, easy-to-use, easy-to-sustain solutions that meet diverse needs," Ren says. "Because of our global relationships and our technical and operational capabilities, Sandia is well-positioned to provide the support, the expertise, and the guidance to help create new solutions and partners that strengthen global security objectives."

Wonders of Fusion introduces complex topic to a broad audience

First book by Lab News science writer Neal Singer examines ultimate energy source

Neal Singer, who's been writing about science for the *Lab News* and for the general public as part of Sandia's media relations team since 1995, is the author of a new book that takes fresh look at that philosopher's stone of energy sources, nuclear fusion. Neal's book, *Wonders of Nuclear Fusion: Creating an Ultimate Energy Source*, was published in May by UNM Press as part of its Barbara Guth Worlds of Wonder Science Series for Young Readers.



NEAL SINGER

Although aimed at a youthful readership, the book is an accessible introduction to a complex topic for the interested adult reader as well.

The *Lab News* recently asked Neal to talk about his book and his thoughts on nuclear fusion as an energy source. Here's the interview:

Lab News: Why a book about nuclear fusion as an energy source? Aren't there a lot more viable options out there that ought to be commanding our attention?

Neal Singer: Fusion became vivid in my mind because of the remarkable progress that occurred at Z in my first year here, 1995, and for several years afterward. There was fusion (rather than revolution) in the air that

raised the possibility that we had a fusion energy machine right in our backyard. Power from seawater — half a bathtub-full producing the equivalent of 40 train car loads of coal — seemed an exciting possibility and a worthy goal. The roughly \$20 billion currently on the world's table for a variety of fusion efforts meant that I wasn't alone in my enthusiasm for a positive outcome. I was aware, of course, of the cynical tagline, "it's always 30 years away." Had I been working on fusion since the 1960s, I might have felt that way too. But I came to the subject freshly at a relatively late date, and I see remarkable progress already achieved as well as predicted for several machines in this decade.

LN: When did you decide to write the book? How long did you work on it?

NS: University of New Mexico Press first discussed the book with me at the end of 2006; I worked on it about a year, through an illness, and then the Press went through a personnel shuffling that slowed down publication.

LN: What's the single most surprising thing you learned as you did your research?

NS: It was all surprising: The scientific theory, the engineering problems to overcome, the question of funding, the rivalries between the labs, the direction from Washington, the tie with Siberia.

LN: There's a longstanding joke — a joke with a bite — in the physics community that nuclear fusion-based energy is just 30 years away . . . and always will be. Is there reason to believe that things have changed?

NS: The output of magnetic fusion efforts has increased about a million times in the last 20 years, according to a graph put out by General Atomics. We may still, ultimately, be 30 years away from actually seeing fusion power plants dotting the landscape. But we have researchers at Z who are confident that with sufficient funding,

they can achieve a significant step — breakeven, energy out equal to energy in — in only a few years. The National Ignition Facility lasers at Lawrence Livermore National Laboratory just achieved 10 to the 13th fusion neutron output from a deuterium tritium shot, and they're not yet up to full laser power output. They need 10 to the 16th to show gain, they tell me. They're proceeding cautiously, but they're proceeding. And ITER predicts ignition by the close of this decade. They all may be wrong, but that's their projections.

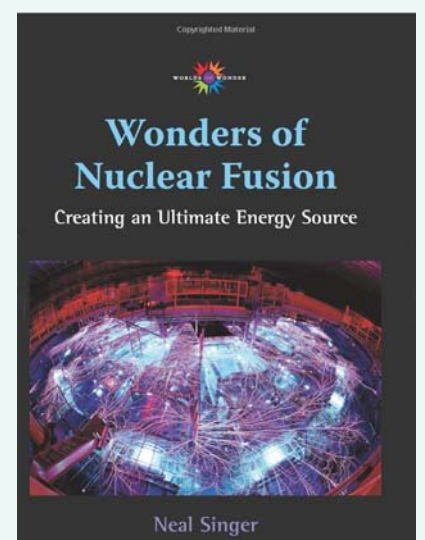
LN: Despite its promise and demonstrated reliability, the general public remains skeptical about nuclear energy — fission-based energy, that is. Will the public be more receptive to fusion power?

NS: First impressions are hard to change. Fusion, like fission, was ushered into public consciousness as a destructive force. But I think education about the relative benignity of the process — particularly that a fusion plant will shut down on its own when trouble arises, rather than spin up, as fission can — will make a difference.

LN: In the 1950s, at the dawn of the nuclear fission era, the chairman of the Atomic Energy Commission said: "Our children will enjoy in their homes electrical energy too cheap to meter . . ." The quote has long been misinterpreted to suggest that the chairman, Lewis Strauss, was referring to fission. The context of his remarks makes clear he was referring to nuclear fusion-based power plants. Do proponents of nuclear fusion today make any such similar promise?

NS: No one thinks nuclear fusion energy will be free. Power plants will be expensive to build. Their cost must be amortized, and the public will pay as it would for any energy-delivery system. But it could be more painless as an energy source than other steady-state energy deliverers. Fusion can use seawater as its source for deuterium, instead of mining uranium, a dangerous process involving tailings at the outset. The half-life of tritium is 12-something years instead of tens of thousands. A fusion reactor encountering a problem would just stop — it's hard to force atoms to fuse — rather than continue on its own like a runaway car, like a fission pile that's lost its ability to absorb neutrons with its damper rods. And it won't put out sulfur, like a coal plant. It won't need the wind to blow or the sun to shine. It'll be a sun, created by our minds and skills, on Earth.

Wonders of Nuclear Fusion: Creating an Ultimate Energy Source is Neal's first book. It is available at local bookstores and at online sources, including Amazon.com.



Sandia shines in DOE Security Protection Officer team competition

By Iris Aboytes

A Sandia trio — Joseph (Joey) Branch, Norman Baca, and Ruben Padilla (all 4233) — recently won the DOE three-man team event at the 39th annual DOE Security Protection Officer Competition (SPOTC). The three-day event was held at NNSA's Pantex facility in Amarillo, Texas. This is the first time a Sandia team has won this particular competition.

Sandia competed against teams from DOE Headquarters, URENCO, United States Enrichment Corporation PGDP, and the Kansas City Plant.

All three Sandia participants have competed before, so they knew what to expect. When the dust cleared and the winners were announced, Sandia had won five awards, three firsts and two seconds in the seven-event competition. Their closest competitor, the Kansas City Plant, was 50 points behind.

To prepare for the competition, the team began attending physical workouts designed especially for them by HBE health professional John Pier. They included conditioning, endurance, and stretches. Obstacle courses are not very muscle-friendly, so they worked on flexibility and endurance. That conditioning lasted for about an hour every day. From there they would do a cardio workout and then spend time on team training.

The drills were designed by their coaches, Lt. Andy Tabios and Lt. Pat. Stott (both 4211), to mimic the competitive events.

"Our team was a contender from the beginning," says Pat. "Norman, Ruben, and Joey are in good physi-



CRACK SHOTS — Sandia's three-man pistol team, left to right, Norman Baca, Joey Branch, and Ruben Padilla (all 4233), took first place in DOE's annual Security Protection Officer Competition held at NNSA's Pantex facility in Amarillo, Texas. (Photo by Randy Montoya)

cal shape and have the determination to succeed, not just individually but as a team. Shooting accurately with speed is challenging. Add to it mentally challenging tasks, and you have a SPOTC competition. That is where we focused our training and preparation.

"Targets were engaged in specific order based on colors, numbers, and sizes. It's the little things that can prevent a team from winning. Safety was foremost in the training during the SPOTC competition. If the team is the safest, best mentally, and physically prepared, have the required skill, and is team motivated, you'll have a winning team. We had a winning team.

Andy agrees. "From previous experience," he says, "Pat and I know the challenges to be overcome in winning the coveted award. We emphasized the importance of shooting within individual limitations accurately and moving as a team. Most important is communicating as a cohesive team, watching and listening to each other before, during, and after each event.

Ruben says the team did not go for speed. "We weren't the youngest team or the fastest," says Ruben. "We were methodical in our approach. We paid attention to detail and concentrated on accuracy and safety. At the suggestion of Joey, our captain, we practiced every evening after the competition. Winning was very surreal."

"The three-week preparation time was put to great use," says Joey. "Along with Pat and Andy, Eloy Giron, Dave Seabrook, and Frank Delgado (all 4211) helped us at the live-fire range. We also had some members of our management staff attend some of our courses of fire. It felt great to have that type of support while competing.

"Our team is very thankful for getting the opportunity to represent Sandia in this year's SPOTC. We've all been members of previous SPOTC teams before, but this team was one of the most focused and determined. In these types of competitions, everyone can shoot and everyone can run. The team who handles the stress the best ends up winning. I am glad it was our team.

"All of the attention is nice," Joey adds, "but I just hope this recognition spills over to our pro force as well."

Employee death

Frank Lujan was short in stature but he was taller than most men

Frank Lujan, Jr. (10242) died on June 25. He was 56 years old and had been at Sandia almost 28 years. His wife, Debra Lujan, works in Dept. 5761. Together they have three sons, Jason, Dominic, and Adriano, and a granddaughter, Jaslyn.

"Frank was a Sandia contracting representative, responsible for supporting the manufacturing liaison efforts at the Laboratories," says his boss, Ian Cheng (10242). "He guided solicitations, issuance, and documentation of purchase orders through the procurement system. He took a lot of pride in the number of transactions he could process, and often led the department in that area on a monthly basis. His experience, grasp of procurement processes, and customer relation skills made him a favorite buyer for multiple technical line

customers who needed to get things done."

Frank's wife, Debbie, says, "I loved Frank very much. He used to say, 'I may not get my reward here on Earth, but in heaven. Frank loved working at Sandia and the people he worked with. He was very smart and well-versed. He worked hard and did a good job.'"

Saw the good in people

"My dad was a great man," says his son, Adriano. "He led by example. He didn't judge others; instead he saw the good in them. My friends were in awe of my dad. They looked forward to seeing and hearing his little pep talks. We will miss him but know he is in a better place."

His friend and schoolmate, Rochelle Lari (3502), says that Frank came to work at Sandia because he heard this was the best place to work. He had both bachelor's and master's degrees but hired on as a custodian, says Rochelle, because "he wanted to get his foot in the door. His goal all these years was to become a member of the laboratory staff."

Frank had many passions; one was working in the South Valley to provide services to the elderly. Before coming to Sandia, he was director of youth programs at Youth Development Inc.

For Fred Romo (10248), Frank epitomized the qualities desired in a Sandian. "Procurement is a unique position," says Fred. "A significant portion of Sandia's budget passes through contracts for goods and services. To that end Frank made significant contributions to Sandia's mission in how many contracts he placed, how much money he saved, how many contracts he completed, how much revenue he provided to small business, and how much business he did in the state of New Mexico. Frank was a great ambassador for Sandia.

"He was a true UNM Lobo fanatic — especially the Lady Lobos. He was a longtime season-ticket holder. He was a Lobo Booster Club and UNM Alumni Association member."

Fred says that to supplement his Sandia income, Frank had two jobs, earning awards from his other jobs.

Becky McIntyre-Pacheco (5573) recalls Frank as "a true gentleman."

"His top three loves," Becky says, "were God, family, and the Lobos. Any of these could get him excited. Frank read his Bible every day, keeping it as his desk for easy reading. His love for his family ran deep. I would tease him about the way he said 'Deb' with so much love. He would then go on to tell me how beautiful she was and how his heart pounded when he first met her.

"When his granddaughter came he claimed he wasn't ready to be a grandfather — too young — but she quickly stole his heart."

Carleen Bardwell Shirk (10242) says Frank had a fun



FRANK LUJAN and his wife, Debbie.

personality and great sense of humor. "He always livened our department meetings," says Carleen. "He would always walk with a swagger while singing a song. He loved music and going to concerts. He had a drawer full of CDs at his desk and would welcome sharing any of his music just so he could discuss it later."

Enjoyed the simple things

"Frank was the kind of guy who epitomized perseverance and standing up for one's beliefs," says Fabian Aragon (10691). "I always felt energized after talking with him. I wish Frank would have been able to realize his dream of being promoted to an exempt staff position.

"Though Frank was really ambitious, he also expressed how blessed he was to have such a great family and was thankful for all the blessings in his life. He was a man who enjoyed the simple things in life, like eating lunch. He would light up when he would share his feelings about eating a good sandwich."

For Louella Roybal (10248) and others, Frank was their kindred spirit. "He adapted to each personality and could relate to you based on your own personality. If you loved books, he would talk about books. He was an avid reader and was always willing to share a recommendation.

"Frank was a take-charge kind of man. As a member of various organizations, he always had great ideas and was never shy in sharing, but recognized he didn't have all the answers and welcomed new and fresh ideas. Frank may have been short in stature, but he walked with a proud stride that made him tall and confident and set him apart from most."

Two days after Frank's death, his family discovered an email message from Frank. He told them how much he loved them and felt he didn't say it enough. He told them he wanted to leave this earth knowing that he had fought the good fight. He encouraged them to remember all things that their faith has taught them and to live life accordingly.

— Iris Aboytes

Attention Sandia retirees:

Annual Retiree Social scheduled for Aug. 19



MORE THAN 1,125 Sandia retirees and their guests attended the annual Retiree Social/Picnic in 2009 at the Rio Grande Botanic Garden in Albuquerque. The 2011 event will be held at the Embassy Suites Hotel in downtown Albuquerque. (Photo by Lloyd Wilson)

The 2011 Retiree Social will be held Aug. 19, 12:30-3:30 p.m. at the Embassy Suites Hotel Conference Center. There will be plenty of room for gathering of friends, good food, reminiscing, and catching up on each others' lives. Sandia will also provide a park-and-ride service from Hoffmantown Church. An invitation with event details will be sent to retirees via mail in late July.