

# Simulation monitors traffic in contraband material

**Unique procedure that could address proliferation concerns arouses UN interest**

By Neal Singer

A Sandia researcher has developed a simulation program designed to track the illicit trade in fissile and nonfissile radiological material well enough to predict who is building the next nuclear weapon and where they are doing it.

"By using a cluster analysis algorithm coded into a program," says David York (6763), "I evaluated those traffic patterns and routes in which thefts, seizures, and destinations of materials were reported. Data from these examinations were enough to allow me to retrospectively depict the A. Q. Khan network before it was uncovered."

Khan is a Pakistani scientist linked to the illicit proliferation of nuclear technical knowledge. Cluster analyses link data of common place, time, or material. Testing a computer simulation on a known past event is one means of establishing the program's validity.

In the Khan analysis, David generated an analysis of networked routes indicative of a nuclear trafficking scheme between countries. In several verified incidents, inspectors seized uranium enriched to 80 percent, as well as dual-use items indicative of small-scale development



TRACKING ILLICIT TRADE — David York, left, shows John Reynolds a simulation program designed to track illicit trade in both fissile and nonfissile radiological material. (Photo by Randy Montoya)

of crude nuclear devices.

In the study, David collected and collated data from 800 open-source incidents from 1992 to the present, along with the movement of dual-use items like beryllium and zirconium. He plotted the

incidents on a geographical information system (GIS) software platform. He came up with a network of countries and routes between countries indicative of an illicit nuclear and radiological trafficking scheme.

"The number of incidents and the quantity and quality of material seized is disturbing," David says, "particularly because this may represent a small percentage of the actual amount of material being trafficked."

The situation may be worse than it appears because much information about nuclear material traffic is classified, David says, to prevent embarrassment to countries through which a nuclear weapon or the materials to fabricate a weapon may have passed.

David presented his results in October at the International Safeguards Conference sponsored by the United Nations' International Atomic Energy Agency (IAEA) in Vienna, Austria. He has also been invited to present his methods and conclusions to the European Union's Illicit Trafficking Working Group at the June meeting of the IAEA.

How does the method work? "One begins by conducting cluster analyses on the GIS platform (Continued on page 4)

## Sandia LabNews

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## An outstanding year

**Operational improvements boost 'report card' score**

By Bill Murphy

Sandia has received an "outstanding" rating for 2006 in the annual NNSA Performance Evaluation Report, issued in late December. The report considers and weighs virtually every aspect of the Labs: its programmatic work, its stewardship of its science and technology foundations, and its operational processes and procedures.

"We worked very hard to earn this," says Labs Director Tom Hunter. "It was no easy test. And it was an important stretch for the Laboratories to come to a new level of performance. We were intentional. We were disciplined. We were serious. It was difficult and we did it."

NNSA Sandia Site Office Manager Patty Wagner praised the Labs' FY06 performance.

"Sandia earned an outstanding rating because of its exceptional leadership across the Nuclear Weapons Complex, providing high-quality science and engineering," she says. "In addition, Sandia's leadership has made great strides in moving forward on its Operational Excellence journey. I look forward to their continued progress."

The PER is based on NNSA's evaluation of how well the Labs did in fulfilling the objectives spelled out in the annual Performance Evaluation Plan, or PEP. The PEP is finalized at the beginning of the fiscal year; the PER report card comes a few months after the end of the fiscal year.

It is important, Tom says, that Sandians appreciate that the Performance Evaluation Plan — the plan against which the Labs' performance is measured —

is not a to-do list mandated by NNSA and the Sandia Site Office. Rather, he says, "The Labs' M&O contract and the annual Performance Evaluation Plan are constructed around and argue for an important future state for the Laboratory. . . . It's very important to understand that [the PEP] is consistent with where we want the Laboratory to go."

### SSO/Sandia relationship



Sandia Site Office Manager Patty Wagner talks about the SSO/Sandia relationship and more in an interview on page 8.

The PEP, Tom says, is a statement of Sandia's intent and its formulation each year is done collaboratively with DOE, NNSA, and NNSA/SSO.

"This isn't a unilateral process," Tom says. "We spend quite a bit of effort with DOE, the Site Office, and NNSA headquarters defining each year a set of measurables. Those measurables, then, allow us to evaluate our progress on our

(Continued on page 4)



TOM HUNTER

## Researchers work in terahertz spectrum to develop next generation of screening devices

By Chris Burroughs

It might not be science fiction much longer.

Sandia researchers are developing the next generation of screening devices that will identify hazardous and toxic materials even if concealed by clothing and packaging materials.

Working in the underutilized terahertz (THz) portion of the electromagnetic spectrum that lies between microwaves and infrared, a team of Labs scientists is harnessing Sandia's strengths in a variety of technical areas with the goal of building a highly integrated miniaturized terahertz transmitter-receiver (transceiver) that could make a number of applications possible.

The project, the Terahertz Microelectronics Transceiver Grand Challenge, is in its second of three years of funding through Sandia's internal Laboratory Directed Research and Development program.

"The technology being developed in the Grand Challenge can be used to scan for items such as concealed weapons or materials, explosives, and weapons of mass destruction," says Mike Wanke (1725), principal investigator. "In addition,

(Continued on page 5)



### Enough snow for you?

Sandia's snow removal team had their hands full during the huge storm that moved slowly through New Mexico on Dec. 29-30. Read about the team's efforts on page 7.

## Clearing the air: Tobacco free policy takes effect Labs-wide March 1

**Sandia goal to foster a healthier workplace**

By John German

Last week Labs employees were notified that beginning March 1 use of all tobacco products, including cigarettes and chewing tobacco, will be prohibited at all Sandia work locations, both inside and outside of buildings.

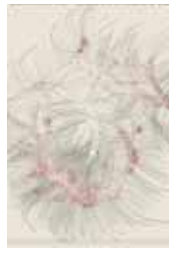
The policy change is the result of a decision by Labs top management to follow the example of companies and governments that prohibit tobacco use in workplaces and public spaces. It expands the current Sandia policy that prohibits smoking in buildings and government vehicles. Lockheed Martin adopted a similar policy beginning Jan. 1.

(Continued on page 4)



### Why does gold glitter?

A Sandia/California team examining materials properties has applied theoretical innovations to make a hard-to-use theoretical approach amenable to computation. See story on page 3.



### Picturing science

Sandia researchers create map representing 800,000 scientific papers, showing relationships among them and different scientific disciplines. See story and map on page 6.

# THE TOP 20!

### Top papers

Sandians are listed as authors of two of the 20 most highly referenced papers in materials science in the last 10 years. See story on page 6.



# What's what

Snow and sand have played big parts in life at the New Mexico lab site so far this year.

First, snow had everybody two-stepping around the return to work Jan. 2. Head for the base, or not? Try another gate when the guards at the first one turned you back, or not? Delay arrival by two hours, or four? Since you work somewhere other than Tech Area 1, proclaimed the only tech area open that first day back, what? You're already at work in TA-4, but is it closed? And if so, should you be there?



HOWARD KERCHEVAL

That first day back after the break was more than a little confusing. But things began settling down by midday, with a timely announcement that everyone should go home by 3 p.m. so crews could move snow out of parking areas and off walkways. And there was an early announcement of a two-hour delay in coming to work the following day.

But if you were bewildered by the to-go-or-not-to-go confusion, remember that we're not used to having to deal with so much snow and that it practically paralyzed the whole city, as well as highways across most of the northern half of the state. At least we didn't have to sleep in our clothes and eat untoasted Pop-Tarts like so many who were stranded in long lines of immobile vehicles along interstate highways for a couple of days.

Now, about the sand.

Discovery late last week of a container whose contents were thought to have become unstable sent the Emergency Management folks into action, resulting in the evacuation of a building. The plan was pretty straightforward: Stabilize the container in sand so it could be removed from the building without being agitated.

But wait, all the sand outside is wet from all the snowmelt. Or still buried under snow. Buy some bags in town? Sorry, sold out to all the people sanding sidewalks, driveways, and streets. What to do?

Sometimes, solutions are right at hand, and this was one of those times. Emergency Director Kathleen McCaughey (2700) had some bags of sand in the back of her pickup truck to add weight and stability for driving on icy streets. The sand was in waterproof bags and it saved the day.

Problem solved. Situation resolved. Back to work.

\* \* \*

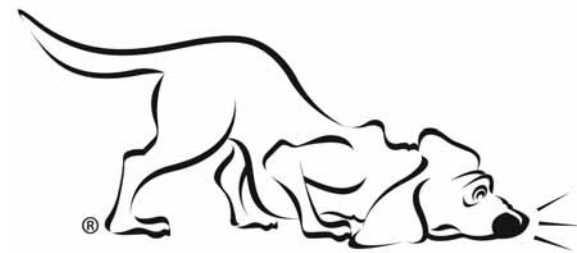
Those in the upper reaches of the Labs' management hierarchy are the Sandians most likely to deal with the Sandia Site Office – the National Nuclear Security Agency group directly involved in oversight of Sandia's work. If you're not part of that management group, you may wonder sometimes what SSO is and what the folks who work there do.

To answer some of those musings, Editor Bill Murphy sat down recently with SSO Manager Patty Wagner to talk about the relationship between SSO and Sandia and each of their roles in pursuit of their national security mission. You'll find it beginning on page 8.

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

# Hound® receives federal trademark

Kevin Linker (6418) and Michael Vittitow (3654) were recently awarded a federal trademark registration for the Hound® name and logo associated with Sandia preconcentration technology



HOUND® logo designed by Michael Vittitow of Sandia's Creative Arts Dept. 3654.

used for trace chemical detection. Kevin is the inventor of the technology and Michael created the logo.

"The preconcentration technology has wide applicability in the detection of chemical signatures like explosives and narcotics," says Kevin. "The trademark brings name recognition and associates our technology with the trademark, which is important to a commercial company marketing a product that incorporates our technology."

Kevin Bieg (11500) was the Sandia attorney responsible for the registration process with the United States Patent and Trademark Office, which began in September 2004. The entire registration process took about 20 months.

## Employee deaths

Sandians this month are mourning the loss of two colleagues, Chris Kureczko and George Samara. Brief stories about their lives and their work at Sandia and recollections of some of their colleagues are on page 9. Also on page 9 is a brief note describing the new *Lab News* policy regarding on-roll employee death notices, as well as a clarification of how the *Lab News* handles information about retiree deaths.

## Retiree deaths

Berton E. Barker (age 78)	.....Oct. 24
John W. Melvin (70)	.....Nov. 1
Wallace B. Johnson (78)	.....Nov. 2
Harold E. Howell (69)	.....Nov. 8
Blanche I. Matter (75)	.....Nov. 8
Emma Jean Stuart (82)	.....Nov. 16
Paul A. Longmire (68)	.....Nov. 18
Frank P. Martin (72)	.....Nov. 19
Arthur W. Kellom (79)	.....Nov. 20
Loyt L. Lathrop (96)	.....Nov. 20
Vance E. Prutsman (84)	.....Nov. 21
Henry P. Fell (75)	.....Nov. 22
Carolyn B. Eckart (86)	.....Nov. 23
Charles H. Weidman (97)	.....Nov. 23
Walter Hall (104)	.....Nov. 25
Norma J. Taylor (74)	.....Nov. 25
N.J. Delollis (90)	.....Nov. 27
Ernest L. Arterburn (85)	.....Dec. 3
Mary Ann Reay (64)	.....Dec. 4
Walter H. Barbier (94)	.....Dec. 6
Peter Meisen (69)	.....Dec. 7
Nancy J. Nelson (71)	.....Dec. 7
James H. Workman (75)	.....Dec. 9
Harold M. Meidal (87)	.....Dec. 14
Robert L. Stewart (85)	.....Dec. 16
Christine Baca (85)	.....Dec. 18
Lee F. Parman (88)	.....Dec. 20
Ralph Glenn Bowers (89)	.....Dec. 26
Robert W. Boyden (55)	.....Dec. 28
Michael L. Koszykowski (54)	.....Dec. 28

## Sympathy

To Suzi Jensen (2027) on the death of her mother Dec. 19, 2006.

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Sandia National Laboratories

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## UnitedHealthcare members

### Nationwide laboratory service provider change

#### Little effect likely in New Mexico; some changes in California

UnitedHealthcare (UHC) has entered into a 10-year agreement with Laboratory Corporation of America (LabCorp). This agreement dictates that effective Jan. 1 LabCorp became UHC's single national laboratory service provider. This change affects the in-network status of Quest Diagnostic laboratory services previously contracted with UHC. Effective Jan. 1, Quest Diagnostics was no longer a participating provider in UHC's network except in limited markets.

New Mexico laboratory service disruption or change will be minimal.

Previously California and Nevada members relied heavily on the Quest-contracted facilities, so members will want to seek out new contracted facilities prior to seeking services. In California, UHC's new contract relationship with Stanford Clinical Laboratories will alleviate some of the contracted laboratory services lost with implementation of this change.

To obtain a current list of participating laboratories visit [www.uhclablocator.com](http://www.uhclablocator.com). (On the lab locator screen, type in your ZIP code and then under the subheading that says "UnitedHealthcare" select click on the option that says "other affiliates.")



# Theory aims to describe fundamental properties of materials and facilitate broad research

By Nancy Garcia

Gold is shiny, diamonds are transparent, and iron is magnetic. Have you ever wondered why that is?

Electronic structure determines many material properties, including electrical, optical, and magnetic. Sandia relies extensively on using and controlling such properties, for everything from assuring weapons reliability to creating devices from nanomaterials.

Predicting a material's properties by first calculating its electronic structure would cut down experimental time and might lead researchers to uncover new materials with unexpected benefits.

However, commonly used simulations are inaccurate, especially for materials like silicon, whose strongly correlated electrons influence each other over a distance and make simple calculations difficult.

Now a Sandia team may have a solution that offers huge potential. Sergey Faleev (8756) and colleagues applied theoretical innovations and novel algorithms to make a hard-to-use theoretical approach from 1965 amenable to computation. The team's approach may open the door to discovering new phases of matter, creating new materials, or optimizing performance of compounds and devices such as alloys and solar cells.

Their paper, "Quasiparticle Self-Consistent GW Theory," appeared in the June 9, 2006, issue of *Physical Review Letters*. GW refers to Lars Hedin's 1965 theory that elegantly predicts electronic energy for ground and excited states of materials. "G" stands for the Greens function — used to derive potential and kinetic energy — and "W" is the screened Coulomb interaction, which represents electrostatic force acting on the electrons. "Quasiparticles" are a concept used to describe particle-like behavior in a complex system of interacting particles. Self-consistent means the particle's motion and effective field, which determine each other, are iteratively solved, coming closer and closer to a solution until the result stops changing.

"Our code has no approximation except GW itself," Sergey says. "It's considered to be the most accurate of all GW implementations to date."

"It works well for everything in the periodic table," adds coauthor Mark van Schilfhaarde, a former Sandian now at Arizona State University. The paper reports results for diverse materials whose properties cannot be consistently predicted by any other theory. The 32 examples include alkali metals, semiconductors, wide band-gap insulators, transition metals, transition metal oxides, magnetic insulators, and rare earth compounds.

## Describing force

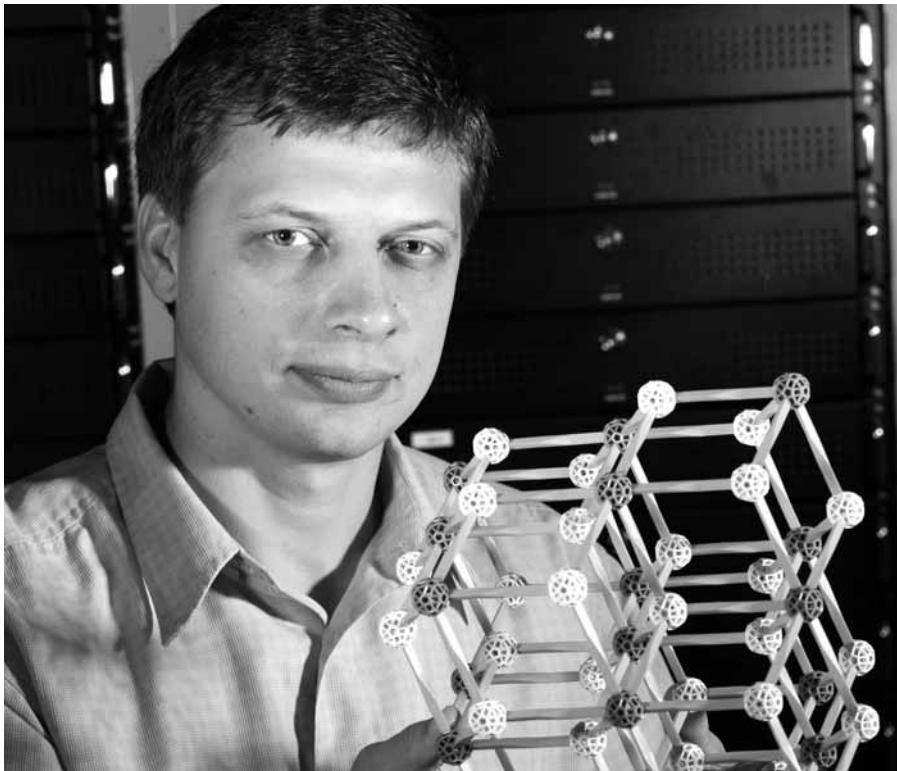
"Everything in solids is held together by electrostatic forces," says van Schilfhaarde. "You can think of this as a huge dance with an astronomically large number of particles,  $10^{23}$ , that is essentially impossible to solve. The raw interactions among the particles are remarkably complex.

"Hedin replaced the raw interactions with 'dressing' the particle with a screened interaction," van Schilfhaarde continues, "so the effective charge is much smaller. It becomes much

more tractable but the equations become more complicated — you have an infinite number of an infinite number of terms. The hope is that the higher-order terms die out quickly."

The researchers' use of GW makes the expansion much more rapidly convergent.

"We're pretty confident we got the approach right," he says. He now would like another group to independently verify this way of framing the task.



IT'S A MATERIAL WORLD after all, and Sergey Faleev looks forward to more problems to solve. Unmet challenges include predicting such properties as optical spectra or the behavior of solids with more than 10 atoms in a unit cell, and speeding the code to apply it to the need to predict conductivity in the pulsed power program.

(Photo by Jeff Shaw)

## Promise and challenges ahead

In 2006, Sergey was invited to present this work to pulsed power and materials researchers at Sandia/New Mexico. They use a molecular dynamics code, VASP (Vienna Ab-initio Simulation Package) to model, for example, equations of state in high-energy-density matter. These equations of state depend on quantities like electrical conductivity. Calculating this requires detailed knowledge of the electronic structure — a perfect application for Sergey's work. The researchers hope to describe optical spectra, calculate total energy, and account for more than 10 atoms in a unit cell — at 100 times the current speed. These are goals Sergey and collaborators are pursuing through Laboratory Directed Research and Development funding.

Accelerating the code would facilitate modeling in other research areas at Sandia, such as simulating titanium dioxide used in surface science, or aiding research into carbon nanotubes that might be used in electronic or optical devices.

"To calculate absorption or optical spectra is a huge problem," Sergey says with anticipation. "To make it faster is a huge problem. To make it more accurate is a huge problem.

To incorporate VASP is a huge problem."

Van Schilfhaarde agrees. "It's quite an accomplishment to do it at all. It takes someone who is very strong in math, and a clever programmer. We spent easily five to six man-years between us to make it work.

"If we can get the approach right, we can have a theory that's universally accurate for anything we want; that's really pretty neat, just requiring knowledge of where the atoms are."

## The quest for precision

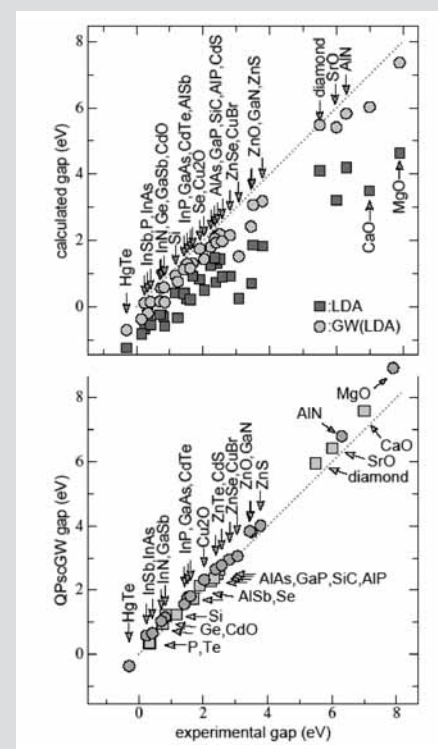
The 1998 Nobel Prize in chemistry was awarded for the widely popular density functional theory (DFT). A simplification often used at its core called the local density approximation (LDA) approximates small fluctuations in electron density by using an effective potential in place of many-body interactions. LDA is very good at predicting certain properties of materials, but has serious limitations. For example, in insulators and semiconductors it is well-known to underestimate band gaps (which an electron cannot cross) by 1 eV or more. Despite its limitations, this approach has garnered 30,000 physics citations in the last five years. (For Sandia connections to DFT Nobel laureate Walter Kohn, who trained some Labs researchers, see *Lab News* articles from the Oct. 23, 1998, and Aug. 23, 2002, issues.)

## Sandia California News

The work done at Sandia goes beyond this approach, taking advantage of the expertise of the three researchers. Van Schilfhaarde had previously written a large DFT code. Sergey studied electron interactions in graduate school. Takao Kotani of Osaka University asked about making a GW code from van Schilfhaarde's large DFT code. He was invited to visit Sandia in the 2000-2001 academic year, the same year Sergey was hired. Sergey eliminated the dependence of GW on LDA, making it 10 times as accurate as DFT. (Small band-gap discrepancies remain, on the order of 0.1 eV, and can be attributed to neglecting higher-order terms.)

Van Schilfhaarde believes the theory's advantage would be to offer true insight into material behavior. "It's kind of like adding night-vision goggles to soldiers working in the dark," he says. "Probably in 10 years," adds Sergey, "everyone will use this."

## Measurements of band gaps



THIS FIGURE COMPARES experimental measurements of band gaps for a range of materials with results from the existing (DFT/LDA) and new (GW) approaches to calculating band gaps. The x-axes show the experimental band gaps, and the y-axes show theoretical band gaps. In each panel, the dotted lines represent where the points would fall if there was exact agreement between theory and experiment. On the top panel, the squares are LDA results (with a 1eV or more deviation from the ideal line) and the circles are non-self-consistent GW band gaps (results are much closer to the ideal line, but still a 0.5 eV difference remains). On the bottom panel are results of Sergey's quasiparticle self-consistent GW (QPscGW) theory that are very close to the ideal line.



## Outstanding

(Continued from page 1)

journey to the proper future state for the Laboratory.”

Sandia, NNSA, and NNSA/SSO management meet quarterly during the year to assess the status of objectives in the Performance Evaluation Plan. Periodic course corrections are made where called for. Other responsible staff — Sandians and their SSO counterparts — meet more frequently to address details in the performance plan at a deeper level.

The annual Performance Evaluation Report, Tom says, “allows us to know not only how well we’ve done against the measurables [in the PEP] but also whether the Sandia contract has been extended for another year. By the way, it’s important to note that an outstanding rating does not automatically result in a contract extension. If we get that outstanding rating and do what I call extra credit — extra activities called award term incentives — that are done on top of getting an outstanding, then we earn the contract extension. Higher performance scores in one area of the contract, called performance incentives, result in an increase in fee award for Lockheed Martin Corporation. Receiving an award term extension to the

## Contraband

(Continued from page 1)

for material or activity similar to the incident in question. This gives the analyst an idea of corridors used by potential smugglers. It also indicates where the material might have come from and where it is,” says David. “If the trafficker has only a certain amount of time to reach a destination, and you have that information, one can ask what is the shortest route from point A to point B, or find major highways needed to accommodate a large shipment.”

For the tool to be effective, “Enough information must be collected under a cooperative international framework,” David says. “Then info must be analyzed to separate patterns from noise, essentially creating intelligence.”

Nation-states that reuse nuclear fuel through reprocessing can create and ship dangerous materials that previously were confined to the more industrialized world.

“We’re trying to develop a market niche for this kind of tracking program,” says Sandia Manager Gary Rochau (6763), “and I think we’re ahead of everyone’s headlights.”

The method can be used to track other materials, such as drugs. “We have a lot of interest from a lot of agencies,” says Gary.

Trafficking may be engaged in by amateur smugglers trying to feed their families in a post-Soviet era. It may also be practiced by organized crime that finds a lucrative market in moving illicit materials, and by terrorists interested in the potential devastation and psychological effects of the use of nuclear materials.

David developed the program as part of his master’s thesis while a student intern at Sandia.



THIS SLIDE REPRESENTS a pathway analysis where the line is computed via a cluster analysis of specific weighting factors. These factors are deduced from available intelligence to the analyst conducting the trafficking analysis. The actual seizure site of this particular incident was in Grozny, Chechnya, depicted by the star. Based on available intelligence, it is apparent that the pathway analysis follows a probabilistic route taken by the traffickers.

contract is a sign of NNSA’s satisfaction with Sandia management and benefits the Laboratory by contributing to stability of operations.”

Although the annual Performance Evaluation Report is done by NNSA, it also evaluates work that is not NNSA-specific. As Tom explains: “In its evaluation, NNSA feels that it’s important to look at how we’re doing for other customers and how well we’re acting as stewards for the Laboratory as a whole.”

The evaluation also looks at the entire range of operational processes. The final report card is the balanced score of programmatic and operational objectives; if the aggregate of the two scores is 90 percent or higher, an outstanding rating is awarded.

“Historically,” Tom says, “we’ve always done well programmatically and not as well operationally. This year, we significantly improved our operational performance. So we raised our operational score and kept our programmatic score about the same.”

Regarding that improved operational score, Tom says, “We view this as a step in the right direction, but not as an end point. We knew we needed to raise our operational performance and we did so, but we still view it as not where we want to be. Our intent is to reach the outstanding range in all those areas as well.”

To improve that operational score, Tom says, “We need to be more assertive about the way in which we are choosing to operate the laboratory. We have to define all of our operational systems in a much more thorough, more disciplined, and structured way and then carry them out, with evidence that we have carried them out.

“Now, central to accomplishing that is something we’ve already got in place — the Integrated Laboratory Management System, which will be the way we express what those systems are and the way we provide information to NNSA about what they are and how well they’re functioning.”

To bring Sandia’s operational performance to the outstanding level, Tom says, “We need to make the ILMS real, vibrant, and complete with respect to the systems embedded within it, with clear evidence that we are performing against those systems.

“If the question is what do we have to do, the answer is ILMS.”

Tom says the outstanding rating has significance beyond the gates of Sandia. “We are viewed as a model by DOE, as a test bed, and we want to

be seen as leaders in evolving the appropriate governing structure and contractual basis for DOE contractors in general. We take that responsibility seriously; we’re working very hard and we hope that our learnings and DOE’s learnings can enable them to work much more effectively across the whole complex.”

### Year-round process features frank self-assessments

The annual Performance Evaluation Report, or PER, issued by NNSA comes at the end of a year-round process that engages on some level virtually everyone at the Labs.

The PER is NNSA’s way of grading Sandia against the objectives set out in the annual Performance Evaluation Plan, or PEP. And the acronyms don’t end there. Near the end of the year, Sandia does a final self-assessment, its own internal report card judging itself against the PEP objectives. That year-end self-assessment is called the Performance Evaluation and Assurance Report, or PEAR.

The goal at Sandia is that the self-graded PEAR and the NNSA-graded PER be as close as possible to each other.

For the 2006 fiscal year, in fact, the PEAR and PER scores were much closer than they had been the year before, suggesting that Sandia and NNSA are seeing things more in the same light than has previously been the case.

The administrative responsibilities related to the Labs’ performance evaluation process belong to Performance Evaluation Dept. 10731 and Manager Michael “Cass” Cassidy and his team. Cass is a keeper of numbers. He has data on self-assessments and NNSA report cards going back to FY97 — and he knows the numbers, knows the trends, and knows the message behind the numbers.

Cass emphasizes that Sandia’s annual PEAR is not a sugar-coated “PR document.” “It’s designed to be honest,” Cass says. “It extols our virtues — as we see them — but it also unveils our shortcomings. It’s frank and self-reflective. We strive to produce a best-in-complex self-assessment document.”

— Bill Murphy

## Tobacco free

(Continued from page 1)

Sandia’s goal, says Dr. Larry Clevenger, director of Health, Benefits, & Employee Services Center 3300, is to improve the overall health of Sandia’s workforce.

Cost savings was not a major factor in the decision, he says, although lower health care costs and fewer lost work hours due to tobacco-related illnesses may be a long-term outcome if large numbers of Sandians stop using tobacco.

“What we are after is a healthier workplace and the possibility that some people will make the choice to quit using tobacco altogether if they don’t use it during work hours,” Larry says.

An online Sandia tobacco free website describing the new policy and summarizing tobacco-cessation assistance options is available at [www-irn.sandia.gov/tobaccoFree](http://www-irn.sandia.gov/tobaccoFree).

### Help is available

Tobacco use is a top public health threat in the US, says Debra Menke, manager of Healthcare and Support Services Dept. 3334. It is clearly linked to chronic illness and premature death.

An estimated seven percent of Sandia’s employee population smokes, she says, already much lower than other typical American populations, where the prevalence of smoking is about 21 percent, according to data from the US Centers for Disease Control and Prevention.

But the number could be lower, she says. “We want people to quit, and we are here to help them,” she says.

Sandia offers a number of cessation services, she says, including counseling, coaching, and free medications. Many Sandians have participated in these programs, and most have been able to stop smoking. The programs are offered at no cost to employees. To participate, contact HBE at 505-844-HBES (4237) or see [hbe.sandia.gov](http://hbe.sandia.gov). (In California, call 925-294-2700.)

Tobacco-cessation benefits are available through Sandia’s three health plan providers as well. (See “Getting help” on next page.)

### Need for support

Larry says he hopes the new policy will encourage many Sandians to quit using tobacco products, but cautions that some will have a difficult time.

“This likely will affect not only those who choose to quit, but also those around them,” he says. “In that sense, this is a Labs-wide effort. The best way to help is to be supportive of those people struggling with the effects of cessation.”

Tips on supporting a coworker trying to quit are available at the Sandia tobacco free website.

Meanwhile, details of the policy are being finalized.

“These policies are not easy to implement, and I’m sure there will be many questions and issues in the months ahead,” he says. “But the goal is clear — Sandia wants to have a tobacco-free workplace. We are committed to providing the tools and services to help all Sandians become tobacco free.”

See related stories on next page.





# Terahertz

(Continued from page 1)

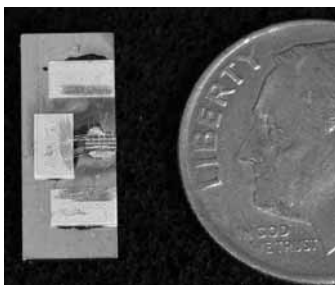
tion, we believe it will find applications in advanced communication systems and high-resolution radars. However, the infrastructure needed to move the terahertz technology from the laboratory to the field is unavailable right now. We want to develop that infrastructure and invent the necessary technologies."

Mike says over the past three years, "the terahertz situation has begun to change dramatically, primarily due to the revolutionary development of terahertz quantum cascade lasers."

These tiny lasers are semiconductor sources of terahertz radiation capable of output powers in excess of 10 mW. Previously, such powers could only be obtained by molecular gas lasers occupying cubic meters and weighing more than 100 kg, or free electron lasers weighing tons and occupying entire buildings.

Quantum cascade laser-based systems can be less than the size of a baseball and powered from a 9V battery. Sandia has been a leader in developing this new technology and in collaboration with MIT is responsible for several world performance records for the lasers. Also, the Labs and its partners are the only US institutions that have demonstrated the ability to grow the unique semiconductor crystals such that they can be turned into operating terahertz quantum cascade lasers. The crystals are grown by Sandia research scientist John Reno (1132), an expert in molecular beam epitaxy, a method of laying down layers of materials with atomic thicknesses onto substrates.

Sandia researchers spent the first year of the Grand Challenge using Sandia's unique strengths in integrated microelectronics and device physics to develop components that are now being combined to create an integrated THz microelectronic transceiver, a core enabling element.



MINIATURIZED DEVICE shown next to a dime.

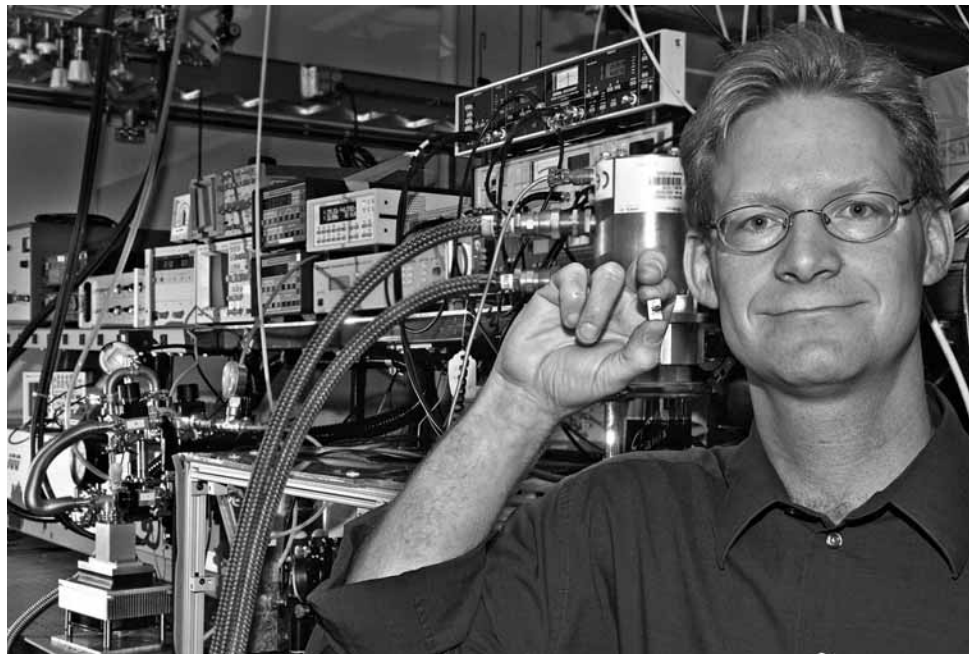
The team is currently developing the receiver, doing systems tests, and exploring packaging requirements. At the end of three years, the researchers expect to have an actual working prototype capable of detecting the materials and chemicals by reading distinctive molecular spectral "signatures."

"Most materials and chemicals have their own unique terahertz spectral signatures," Mike says. "A terahertz transceiver system would be able to measure, for example, the signature of a gas and determine what it is."

"Atmospheric scientists and radio astronomers have spent years developing terahertz spectral signature databases to identify chemicals in nebula and planetary atmospheres," says Greg Hebner (1128), program manager. "Even though the current devices are washing machine-sized, they are located in a few observatories, and one is even flying on a satellite. To address specific national security problems, we are working on reducing the size, weight, and power requirement as well as expanding the existing spectral databases."

In addition to monitoring for concealed hazardous materials, Mike believes a terahertz system can be used to monitor the air for toxic materials. Using air sampling technology developed at Sandia and other locations, hazardous vapors can be pre-concentrated. Shining light from the quantum cascade laser through the concentrated sample provides a direct identification of the vapor. This technology can be used in conjunction with existing mass spectrometer-based systems to reduce false identifications.

"We are very optimistic about working in the terahertz electromagnetic spectrum," Mike says.



MIKE WANKE, principal investigator of the Terahertz Microelectronics Transceiver Grand Challenge, holds a miniaturized device that will eventually replace large pieces of equipment like those in the background. (Photo by Bill Doty)

"This is an unexplored area and a lot of science can come out of it. We are just beginning to scratch the surface of what THz can do to improve national security."

## Team members

Jerry Simmons (1130), Greg Hebner, Robert Foltynowicz, Paul Miller, Ron Allman (all 1128), Mike Wanke, James Hudgens, Chuck Fuller, Aaron Gin, Maytee Lerttamrab, Sally Samora, Yelena Berliba, Albert Grine, Erik Young, John Williams, Bill Sweatt, Todd Barrick (all 1725), Mark Lee, Eric Shaner, Ines Waldmueller, Weng Chow, Wei Pan, Dan Barton, Clark Highstrete (all 1123), John Reno, Larry Stephenson (both 1132), Igal Brener (1727), A. Alec Talin (8759), Chris Nordquist (1742), Chris Apblet, Amelia Sanchez (both 1723), Roy Jorgenson, Rebecca Coats (both 1652), Francois Leonard (8756), Rene Sells (9114), and Julie Costanzo (9114).

## Getting help

Sandia offers a number of services to help employees quit tobacco use, including counseling, coaching, and free medications. These programs are offered at no cost to employees. To participate, contact HBE at 505-844-4237 (925-294-2700 in California), or see [hbe.sandia.gov](http://hbe.sandia.gov) and search the term "smoking."

All three of Sandia's health plans offer tobacco-cessation benefits as well. For specific information, refer to the Summary Plan Description for your health plan at [www.sandia.gov/resources/emp-ret/spd/index.html](http://www.sandia.gov/resources/emp-ret/spd/index.html).

- **UnitedHealthcare** members can access the QuitSmart™ smoking-cessation program at [www.healthallies.com](http://www.healthallies.com). UnitedHealthcare customer service: 877-835-9855

- **CIGNA** members can access two Healthy Rewards® smoking-cessation discount programs, QuitNet and Tobacco Solutions, at [www.cigna.com/customer\\_care/index.html](http://www.cigna.com/customer_care/index.html). CIGNA members may also buy discounted smoking-cessation products. CIGNA customer service: 800-244-6224

- **Kaiser** members may access a tobacco-cessation class through [www.kaiserpermanente.org](http://www.kaiserpermanente.org). Kaiser customer service: 800-464-4000

Several national organizations offer tobacco-cessation assistance. For more information, go to:

[www-irm.sandia.gov/tobaccoFree](http://www-irm.sandia.gov/tobaccoFree).

# Sandia is going tobacco free

## Key points of Sandia's tobacco free policy

The new tobacco free policy, now being developed, takes effect March 1. Here are the policy's key points:

- The policy covers cigarettes, chewing tobacco, and all other tobacco-based products.
- It is space-oriented, so it applies to any Sandia employee or contractor on Sandia-controlled property.
- It includes walkways, parking lots, and portions of buildings controlled by Sandia, as well as fenced property controlled by Sandia

and interiors of vehicles parked on Sandia-controlled property.

- Sandia is engaged in discussions with the three bargaining units (labor unions) regarding the tobacco-free environment, which must be negotiated prior to this change affecting represented employees.

- As with any other policy, Sandia's standard, progressive disciplinary procedures will apply to violations of the policy.

## Tobacco by the numbers

- According to the Centers for Disease Control and Prevention (CDC), one in every five deaths in the US is smoking related.

- The National Center for Health Statistics reports that the adverse health effects of smoking and related tobacco use are estimated to cause the deaths of more than 400,000 Americans and account for nearly one-third of all cancer deaths in the US each year, including cancers of the lung, throat, mouth, pancreas, kidney, bladder, and cervix.

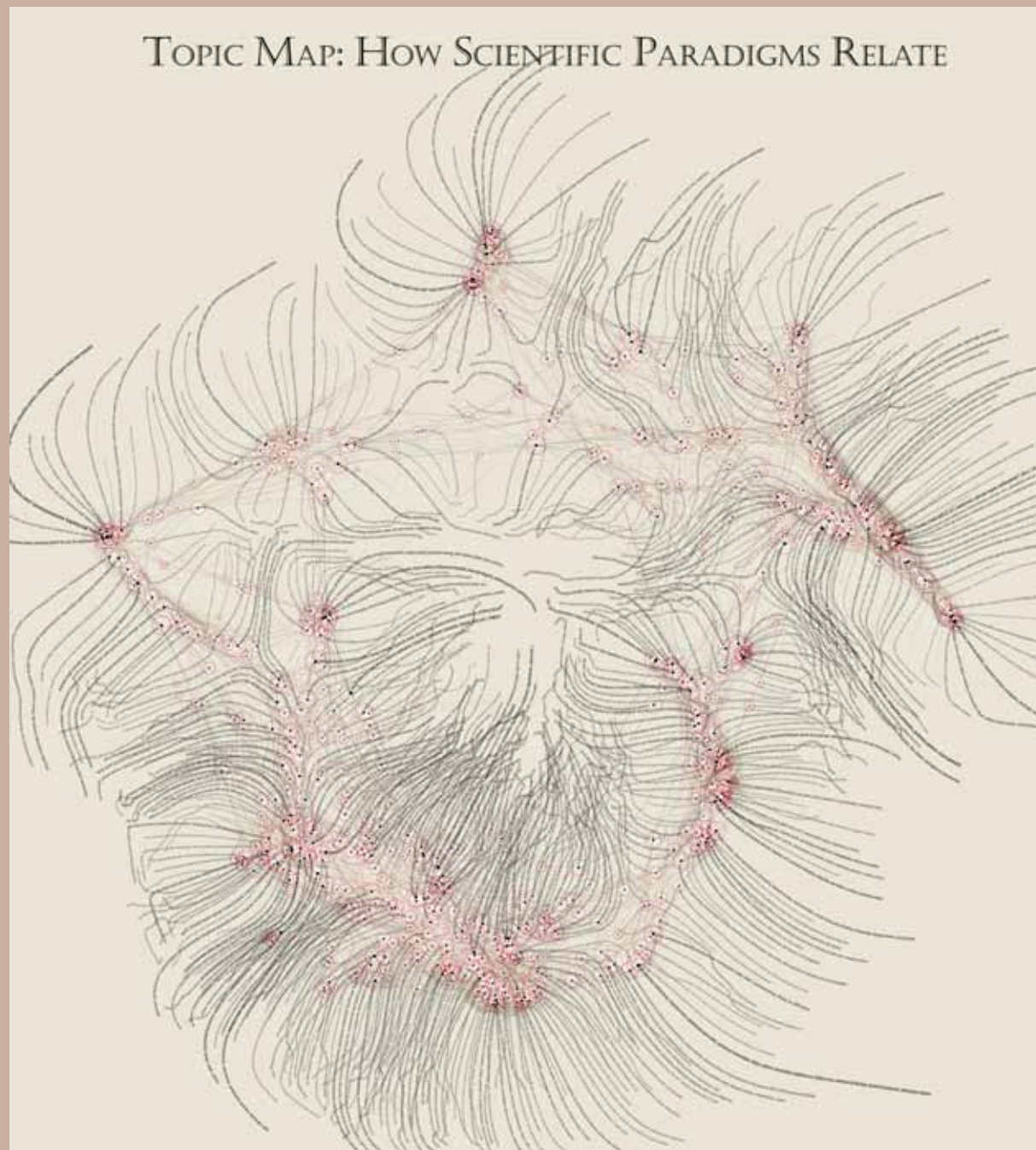
- Other health problems associated with smoking include coronary heart disease,

stroke, emphysema, bronchitis, and adverse pregnancy outcomes. The use of smokeless tobacco (chewing tobacco or snuff) can cause cancer of the mouth and throat and other health problems and can lead to nicotine addiction.

- The health of nonsmokers is adversely affected by exposure to secondhand smoke. US Surgeon General Richard Carmona reported recently that nonsmokers exposed to secondhand smoke increase their risk of developing heart disease by 25 to 30 percent and lung cancer by 20 to 30 percent.



## Map of science shows relationships among 800,000 scientific papers



A MAP OF SCIENCE created by Kevin Boyack (1412) with collaborators Richard Klavans and Brad Paley resembles a filamentous microorganism you might see under a microscope.

The map represents 800,000 scientific papers and shows relationships among them and different scientific disciplines. The “filaments” are common words unique to each “scientific paradigm” — the 776 red circular nodes or clusters of papers. Each node contains papers that are commonly cited together. Larger nodes have more papers. Nodes are connected with lines of various lengths and thicknesses, denoting the strength of the citation linkages between the nodes. Layout of the nodes was done using Sandia’s VxOrd clustering algorithm. Chemistry papers are found in the right-hand peninsula while astrophysics is located at the top. Medicine covers the large region at the lower left.

A four-foot-by-four-foot version of the map is on display at the New York Hall of Science until Feb. 25 as part of the “Places & Spaces: Mapping Science” exhibition. This image also appeared in the Gallery section of the 2006 year-end issue of *Nature* (vol. 444, p. 985).

Kevin, a founding member of the advisory board of Places & Spaces, produced the map in collaboration with Klavans, SciTech Strategies of Berwyn, Pa., and Paley, graphic artist and director of Information Esthetics, New York, N.Y., using 2003 data from Thomson ISI. It was enabled by work performed under a Laboratory Directed Research and Development project whose purpose was to generate large-scale maps of science for planning and evaluation purposes.

For more information on interpreting the map see Paley’s website <http://didi.com/brad/mapOfScience>. For details on the exhibition see [www.scimaps.org](http://www.scimaps.org).

— Julie Hall

## World’s most widely cited materials science papers in last 10 years include several Sandia authors

**Two papers among 20 most-cited on list compiled by the Institute for Scientific Information**

By Neal Singer

Sandians are listed as authors of two of the 20 most highly referenced papers in materials science in the last 10 years, according to a table published by the Institute for Scientific Information (ISI).

The second most-cited materials paper in the world from 1996 through 2006 is authored in part by Mike Siegal (1112), with tunneling electron microscope images provided by Paula Provencio (1111). The paper, “Synthesis of large

***The nanotube paper provided the first demonstration that carbon nanotube arrays could be grown perpendicular to a substrate.***

arrays of well-aligned carbon nanotubes on glass,” was cited 941 times. It was published in *Science* Nov. 6, 1998. The paper’s lead author is Z. F. Ren of the State University of New York-Buffalo.

The principal investigator and contact author of the 17th most cited paper is Sandia Fellow Jeff Brinker. The paper, referenced 501 times and titled “Continuous formation of supported cubic and hexagonal mesoporous films by sol gel dip-coating,” appeared in the Sept. 25, 1997, issue of *Nature*.

The rankings were extracted from a pool of 3,401 papers that themselves comprised the top one percent of all materials papers tabulated,

according to calculations performed by *In-cites*, an online publication of ISI, in its November edition. ISI is organizationally part of Thomson Scientific, based in Philadelphia.

The nanotube paper provided the first demonstration that carbon nanotube arrays could be grown perpendicular to a substrate, says Mike.

“Until then,” he says, “nanotube alignment during growth was uncontrolled and resembled a plate of spaghetti.”

The Sandia role was to prove, he says, “that these vertically aligned structures were indeed hollow carbon nanotubes.”

The new alignments, similar to fields of wheat or bristles on a brush, greatly improved the promise of applications involving cold-cathode field emission such as flat-panel displays and other room-temperature electron beam sources, including Sandia-specific needs in pulsed-power. Other applications include antennas and nanoelectrodes for electrochemical sensing.

A new Lockheed Martin Shared Vision program expected to start within the next few months is based on extensions of this work.

The sol-gel paper wedded sol-gel processing to molecular self-assembly. The paper demonstrated the organizational properties of surfactants in spontaneously assembling into periodic structures. These shapes, called micelles, were found to orchestrate the arrangements of additional materials added to the solution. In a

series of high-profile papers, three of which are among Sandia’s most cited for the same time

***The Brinker group went on to show that removal of the surfactant by heating or solvent extraction left behind nanostructures able to achieve a variety of tasks.***

period, the Brinker group went on to show that removal of the surfactant by heating or solvent extraction left behind nanostructures able to achieve a variety of tasks.

Third author Celeste Drewien’s (0241) microstructural and crystallographic analyses using tunneling electron microscopy and X-ray diffraction played a role in the sol-gel paper’s success.

Of the initial highly cited paper, coauthor Jeffrey Zink, a chemistry professor at UCLA, emailed Jeff that “You certainly started a new area with that one. I’m happy to have been a part of it.”

*In-cites’* materials science category culls journals covering matter and basic materials. These include ceramics, paper and wood products, textiles, composites, coatings and films, biomaterials, metals and alloys, metallurgy, application of chemistry to materials design and testing, superconductors and semiconductors, ferroelectricity, and dielectrics. The list can be accessed at <http://in-cites.com/papers/top20-mat-sci.html>.



# Heroes rise as the snow comes down

There was just so much snow! More snow than anyone could remember. The New Mexico site has 21 acres of walkways and 185 acres of roads and parking lots. A foot of snow on those 206 acres is enough to fill a football field to a height of more than 150 feet (including the end zones).

Photos by members of Sandia's snow removal team

By John Zavadil

2006 went out with a roar in New Mexico.

The huge storm that moved slowly through the state Dec. 29-30 dropped record amounts of snow in the Albuquerque area, including about 12 inches at the Sandia/New Mexico site. The governor declared a national disaster area; freeways to Arizona, Colorado, and Texas were shut down; the city government asked people not to leave their homes unless absolutely necessary; and Kirtland Air Force Base was closed to all nonessential personnel. Most Sandians and contractors were on the winter break and were more than happy to stay away.

However, several Integrated Enabling Services (IES) Strategic Management Unit personnel were on duty as usual: an Incident Commander and people from Security, Steam Plant, and Emergency Management. Whenever snow falls, the Incident Commander also notifies the Facilities snow removal team. Sandia's snow removal plan is designed to handle about four inches of snow, which is as much as Albuquerque normally gets in any one storm. The team usually comes in at 5 a.m.

## Snow removal team

**Manager** — Ernie Nevada; **Team Leaders** — Lonnie Trujillo, Leroy Garcia, Richard Toledo; **Team Members** — Victor Barba, Wayne Breeze, Adolph Candelario, Leroy Chavez, Ralph Chavez, Chuck Dusing, Woody Edwards, Nathan Garcia, Allen Gonzales, Thomas Gutierrez, Robert Leopold, Mark Locke, Richard Lucero, Steve Lucero, Leroy Marquez, Freddie Martinez, Yvonne Molina, Eloy Montano, Pete Nieto, David Olguin, Joseph Olguin, Leroy M. Padilla, Fred Perea, Marty Salazar, Tim Salvador, Phillip Sandoval, Ernest Saucedo, Steve Schneider, Andy Silva, Steve Spindle, John Trujillo, Herman Vallejos, and Cliff Ward. **Communications Support/Planners** — Charles Palacio and Sam Anaya.

and clears the roads, parking lots, and walkways by 10 a.m. Many Sandians don't even see the crews at work.

This storm was far from normal. When the snow started to fall on Friday, Dec. 29, team leader Lonnie Trujillo (10843-3) got a call from the Incident Commander and knew he was in for a long New Year's weekend. He immediately contacted Richard Toledo (10843-2) and Ernie Nevada (10843), and the three of them began to notify the rest of the crew. They ran into a problem right away. On any snowy day, at least 15 team members can make it to the site. This time, many folks were traveling for the holidays or couldn't get out of their driveways.

Fortunately, only a small crew was needed Friday. Chuck Dusing (10843-2) and Ralph Chavez (10843-3) came in and began clearing critical streets, like the access road to Tech Areas 3 and 5, so Security could respond in the event of an emergency. But the snow just kept falling — it was so bad that the team wasn't even asked to come in on Saturday. By Sunday, New Year's Eve, the snow was so deep that Lonnie only called in the equipment operators, who used graders, sanders, front-end loaders, and Bobcats to begin plowing and sanding the main roads and pathways around Tech Area 1. On New Year's Day, 20 workers were able to come to the site, and crews started to clear parking lots, sidewalks, and smaller pathways. On Jan. 2, 45 people pitched in to help, including custodians, electricians, and mechanics. Executive management's decision to close Tech Area 1 at 3 p.m. that day allowed the crews to clear major parking lots that would otherwise have been too full of cars to give the crews room to maneuver. Removal efforts continued on Jan. 3, and most of the snow was out of the way by Thursday, Jan. 4.

## Rising to the challenge

Problems were myriad, but Lonnie's team took each in stride. At the beginning of winter, Facilities bought eight tons of ice-melting compound, which is similar to salt but not harmful to plants or cars. That's enough to handle a normal Albuquerque winter, but as a result of the smaller storm that hit Albuquerque earlier in December, all eight tons were gone by New Year's Day. Sam Anaya (10864-1) called suppliers all over town, but most

were either closed for the holiday or out of stock. Finally, he reached someone at Hunter Lumber who had four tons of ice melt that Sam could have. The problem: It was in a warehouse that was too snowbound for a forklift to access. Hunter employees manually loaded all 8,000 pounds of ice melt onto a truck and delivered it to Sandia by noon on Jan. 2. Most of it was used up by the next day, but by then Facilities had another 12 tons on order.

The cold also hampered snow removal efforts. Even during the day, temperatures barely got above freezing. Crews came in at 5 a.m. and spent most of the day exposed to the elements. Once the sun went down, melted snow quickly refroze into sheets of ice. By 7 p.m. on most nights, crews had to stop working because the graders and other equipment could no longer get traction on the slippery roads. Sand, wet from melting snow, froze and jammed the blades that dump it onto the road.

Workers using shovels to clear pedestrian pathways found the work slow and exhausting, and front-end loaders and Bobcats could only travel 30 or 40 feet before their buckets were full. The team experimented with hauling the snow away, but those efforts proved futile. In the end, the team piled the snow wherever it would fit, which resulted in huge mounds of snow on the sides of streets and at the ends of parking lots.

There were pleasant surprises, too. Ernie Nevada (10843) and Roger Rizkalla (10825) called many of Sandia's contractors who might be able to help remove the snow. Most were either closed for the holidays or had other obligations, but three contractors — ECI, Triangle Paving, and H&D Spraying — were able to help out with equipment and resources. Don Schofield at Sandia's Radioactive and Mixed Waste Management Facility in Tech Area 3 offered two front-end loaders. And Sandia's Fleet Services group provided crews and tankers to keep the snow removal equipment fully fueled.

The storm pushed Sandia's snow removal efforts to the limit and has already prompted lessons learned in planning for the next time a major natural phenomenon hits Sandia.

John Zavadil of Quality, Information, and Communications Dept. 10841 writes occasional stories for the Lab News.





## Sandia Site Office Manager Patty Wagner on SSO/Sandia relationship

*Note: NNSA's Sandia Site Office has primary responsibilities for providing oversight of the Labs' operations and performance against the terms of its management contract. Although SSO shares space with the Labs, many Sandians are not fully familiar with the site office or its functions. The Lab News had a chance recently to sit down with SSO Manager Patty Wagner to talk about her work, her team, and her views about Sandia.*

*Wagner, a native of Santa Fe, has come full circle back to New Mexico after stints with the federal government in several locations and in several roles. "I didn't plan on coming back to New Mexico," she says. "It just worked out that way. It was only after I returned that I realized how much I missed the culture."*

*Wagner has been with DOE for about 10 years, the last two as head of the Sandia Site Office. Previously, she served at Rocky Flats and in the Albuquerque Operations Office of DOE.*

*The interview was conducted by Lab News editor Bill Murphy in Wagner's office.*

**Lab News:** Could you briefly describe the role SSO plays in its relationship with Sandia.

**Patty Wagner:** My office works with Sandia to help assure that Sandia achieves its many nuclear weapons and national security missions and that such activities are conducted consistent with departmental policies and within the intent of Congress. We conduct our oversight through contract administration, technical program liaison, and by being the risk acceptor for the NNSA at the field level.

Let me explain that a bit more: Because it is a government-owned but a contractor-operated facility — a GOCO, as we call it — the government assumes the risk for many of the operations here. So when I say risk acceptor, the Site Office actually decides whether you [Sandia] are prepared to operate the government-owned nuclear and nonnuclear facilities and whether you have an adequate security posture that meets all of our policies and requirements. In terms of risk, we're talking mainly about nuclear safety, ES&H, and security-related issues, although we are aware of programmatic and monetary risks, too.

**LN:** Okay. And when you say contract administrator . . . ?

**PW:** We're responsible for Sandia's Performance Evaluation Plan (PEP); that's something we do annually. In the PEP, expectations for you as a Laboratory in performing the work you've been contracted to do are defined in terms of objectives, measures, and goals. Our mutual collaboration [with Sandia] during the process has been very good and results in a jointly signed product that drives strategic objectives. Related to that, we also prepare Sandia's Performance Evaluation Report or your report card, so to speak. We do evaluations in conjunction with our headquarters program office, but we're the place where all of that comes together for the contract.

### Difficult task

**LN:** Do Sandians appreciate the role you play?

**PW:** I believe the folks at Sandia who have routine interactions with us appreciate our role. The Site Office has been working hard to strike a balance between our regulator role as a federal government agent and the need to achieve

Sandia's national security missions. That's sometimes a very difficult task. But most of us [in government] are public servants because we've chosen to be public servants and it's an important role for us. We're committed to the safety of the workers here. We're committed to safety of the public. We're committed to securing the assets that we've entrusted to the contractor. We understand the critical role that Sandia plays in the security of the nation and we're committed to making sure that Sandia is successful.

**LN:** Speaking of worker safety, are you seeing an impact from the additional emphasis Sandia has placed on that issue over the past year?

**PW:** Yes, I think we are seeing an impact, starting with Sandia's campaign to raise awareness about safety and your efforts to implement that in the line organizations. In Tom Hunter's interview in the *Lab News* [Sept. 15, 2006], he talked a lot about safety. He's clearly made it a priority. So, yes, I think we are seeing a difference and we think that's very important.

There has to be a balance; you have to get the mission done safely. I think the Lab is seeking to find the right balance for getting its mission done safely and securely. This is more than a top-down issue, though. Management can want to operate safely and can talk about safety, but what really matters is the worker. So the real question is, is the Integrated Safety Management Program effective with the worker on the line?

**LN:** We had a story in the *Lab News* recently about the fact that reportable accident cases are going down. Wouldn't that suggest that the [safety] message is getting through to the people on the line?

**PW:** Yes, the total recordable case rate is going down. But we have to be careful with that [as the only metric] because what we really want to know is if the work is being done safely. Also, we need to make sure we have an environment where workers are comfortable reporting safety issues. That's really important.

### Sandia's strategic plan

**LN:** Let's move on to another area. Did you and your team work with Sandia on the Sandia 2007 strategic plan? Is it a plan that NNSA/SSO supports?

**PW:** We didn't work with you on the strategic plan in a direct sense, but we have a lot of dialogue routinely with the Laboratory. Do we support the plan? The answer is yes. Clearly, nuclear weapons is still the primary mission of the Laboratory; there's not a question in our mind about that, but the world is changing. And having

Sandia as a national security laboratory is something the nation needs in today's environment. If you took [your work] in descending order of customer, it's still a weapons lab. However, the other things that Sandia does to complement the

weapons mission and for national security are important, and are supported by the Department.

**LN:** Is there a concern that this roughly 50/50 split of weapons work and other work is somehow going to negatively affect the weapons mission?

**PW:** SSO authorizes all the Work for Others that's done at Sandia. Occasionally, some Work for Others goes through our Headquarters, but the Site Office has approval before the work is authorized to be done at the Lab. Our role is to keep an eye on what the balance is, and we do that by looking at its complementary nature. Does it complement the primary mission? We feel that balance has been accomplished in a way that's thorough and effective.



PATTY WAGNER, Sandia Site Office Manager.  
(Photo by Randy Montoya)

### SSO reorganization

**LN:** Okay. On another subject: Your group has just gone through a reorganization. What are you hoping to accomplish with that?

**PW:** Some of it was internal, to enable us to operate more effectively and to set ourselves up for a good future under the model contract. Also, we appointed a senior-level individual to take charge of risk-based oversight and the model contract and, in particular, what we call contractor assurance, which is your Integrated Laboratory Management System.

Since we executed the [new] contract [with Lockheed Martin] three years ago, both sides have made progress on the model contract elements, but there is more to do. We want to increase the focus on the model contract elements and we'll be working with Lenny Martinez on that effort.

Another purpose [of the SSO reorganization] was to consolidate all of our quality assurance initiatives into one place. And we consolidated our nuclear and nonnuclear facility reps to look at your overall facility operations. That relates to the model contract because we're agreeing to look only at nuclear and high-hazard operations and to rely on the Lab for moderate and low-hazard facilities and industrial safety.

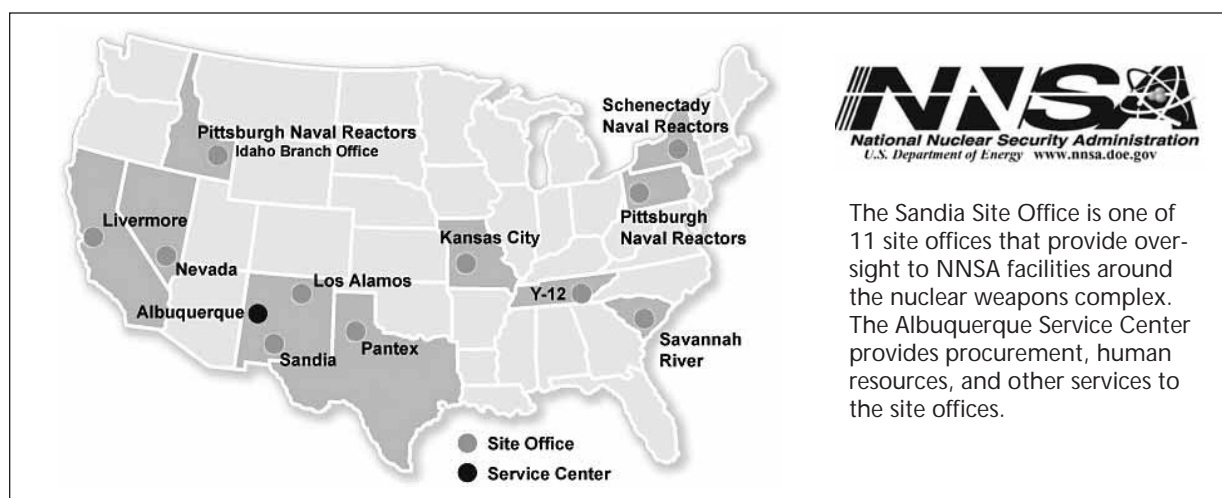
### Sandia's model contract

**LN:** Talk a little about the model contract. What is that, in a nutshell?

**PW:** Broadly described, the model contract emphasizes a systems- and standards-based way of conducting operations; it places an emphasis on a contractor assurance system in which you can demonstrate that your standards-based processes assure the quality of your outcomes, and it places a shift in federal oversight from a transaction approach to a more systematic approach in which the federal oversight focuses more on processes. In that regard, ISO certification and VPP certification [Voluntary Protection Program, a safety process certification] are extremely relevant. The model contract with Sandia has 10 special clauses in it; they're also part of the Los Alamos contract and will be in the new Livermore contract as well.

**LN:** Any successes yet in implementing the model contract?

**PW:** Oh, yes, there have been successes and we've sent a model contract report up to head-



(Continued on next page)



## Employee deaths

# Sandians say farewell to two esteemed colleagues

By long-standing practice, the *Sandia Lab News* has not run formal obituaries for Sandians who pass away while still employed at the Labs. Over the years, the death of an on-roll employee has been noted in the *Lab News* with a brief item conveying only very basic information. Beginning with this issue, the *Lab News* intends to publish more detailed obituaries of colleagues who die while employed at the Labs. On a related matter, the *Lab News* does not, as a rule, publish obituaries about retirees who pass away. This policy, which will not change, is driven by resource considerations. For example, page 2 of this issue lists 30 retirees who died in November and December. Publishing obituaries of each of those individuals is beyond the scope of this publication.

## Chris Kureczko's wit, 'bigger than life' presence remembered

With his "wry, sardonic sense of humor and dry wit," as one colleague put it, Chris Kureczko was "like a cross between Groucho Marx and Steven Wright."

Chris — "Flipper" to his friends — was 46 years old and a valued mechanical technologist in Sandia's nuclear weapons program when he died unexpectedly on Jan. 2. He had just celebrated his 25th year at the Labs.

Chris was born and raised in Long Island, N.Y., before moving to Albuquerque in 1981 to work at Sandia.

Says, Chris' most recent manager, Paul Klarer, "Chris spent his years at Sandia helping to ensure the nation's nuclear weapons were reliable, safe, and secure."

During the course of his time at Sandia, Chris worked in the shops as a programmer, in mechanisms as an assembly and testing technician, and in neutron generator production as a process developer; his latest efforts were in helping Org. 2100 get tooling built for upcoming W76 work at Pantex.

"As you'd expect," Paul recalls, "Chris was good with his hands and liked to make things. He was a musician — he played bass, drums, and sometimes did vocals."

"Chris was a very hard worker yet he seemed to always have fun at it. Always smiling and joking while working those incredibly long hours, Chris was always a bright spot in the day for his colleagues and his friends. He went by the nickname Flipper. We will miss him very much."

Gil Benavides worked with Chris early in both their careers at the Labs. He recalls that when he and Chris worked on the hydrogen control system for a reentry vehicle project, they were working around high-pressure systems that if mishandled could be "like small bombs." Chris, with his knowledge of hardware systems "made sure we did everything right; made sure we didn't do anything stupid. He was a real lifesaver in that regard," Gil says.

"Chris was just great to be around — everybody knew that. People liked to be around him. I noticed in his obituary [in the *Albuquerque Journal*] that Chris' son Maxx said Chris was bigger than life, and that's exactly right. He was brilliant with his wit, but he knew how to be serious and get down to work, too."



CHRIS KURECZKO

## George Samara won international honors, recalled as 'best of the bunch'

George Samara, remembered by a colleague as "the best of the bunch that I worked with out there [Sandia] for 46 years," died Dec. 30 after a long struggle with chronic lymphocytic leukemia. George, a Senior Scientist in Energy Sciences Dept. 1130 at the time of his death at age 70, had worked at Sandia for nearly 45 years.

George, born in a small farming community in Lebanon, came to the US at age 16 to pursue his education and maintain the American citizenship with which he was born (his father was a US citizen). George's son Michael said, "Citizenship was very important to him" and was a major motivating factor in deciding to spend his career at Sandia.

After high school and undergraduate work in Oklahoma, George earned a PhD in chemical engineering from the University of Illinois at Urbana-Champaign and joined Sandia in 1962. His career at the Labs was interrupted only briefly when he served a stint as a project officer at the US Army Electronics Laboratory to fulfill an ROTC obligation.

"George had a powerful influence on Sandia's position in the scientific community," recalls colleague Julia Phillips. "He had a critical role in hiring some of Sandia's best scientists for many decades. He nurtured their scientific efforts, even when it would have been easier to push them in another direction. Many of our world-leading efforts today owe their existence to George's instincts and courage."

George was internationally recognized for his pioneering exploitation of high pressure to resolve fundamental questions about the structure and properties of materials. He was an acknowledged world leader in research on deep-level defects and their role in lattice relaxations in semiconductors, as well as phase transitions in ferroelectric materials.

George was the recipient of many prizes, honors and awards, was active in leadership roles in professional organizations, chaired technical conferences, and authored more than 200 papers and 12 topical reviews, most of them invited.

At Sandia, George held a series of management positions in fundamental physics and chemistry research over a 37-year period beginning in 1967, where he left his mark as a visionary science leader in many, many ways.

George's 15-year management of Sandia's DOE/Basic Energy Sciences core research program in materials science was appreciated well beyond Sandia for its accomplishments and innovations. In recent years, George played a leading role in the founding vision for the joint Sandia/Los Alamos Center for Integrated Nanotechnologies — CINT.

"In many ways," a colleague said, "George served as the champion, standard bearer, and guiding spirit behind Sandia's basic science enterprise. His high professional, ethical, and scientific standards inspired and set examples for both staff and management. He will be sorely missed."

George is survived by his wife Helen, daughter Vicki, and son Michael.



GEORGE SAMARA

## Patty Wagner

(Continued from preceding page)

quarters that documents a lot of the successes. Just to cite a couple: You are now ISO-certified in Procurement. [Since this interview was conducted, the Nuclear Weapons SMU earned ISO certification.] As a result, we don't need to look at [audit] as many transactions as we used to. Another example: On your MESA project, you did an excellent readiness review and the federal government decided not to do one, but rather to rely on your initiative and activities there. So we have some good success stories.

### What keeps you awake?

**LN:** This is a question we often ask senior managers: What keeps you awake at night?

**PW:** We're in the process of agreeing with Sandia on the categorization of hazards at your facility being high, moderate, and low.

We've agreed on those definitions, and now we need to finish that work. I am concerned about worker safety, public safety, and the security of our national assets. The reason I worry is because the mission must be done, and we have to have those [safety and security] risks mitigated correctly so that we can get the mission done properly. It's very, very important that we recognize the balance among all of those things.

**LN:** Is Sandia a good partner to work with?

**PW:** Absolutely. I find Sandia — and so does my staff — to be very responsive. I think change sometimes takes longer than we expect. The Lab is multifaceted. It's like a great ship and sometimes takes a while to make that wide turn, but, ultimately your performance as evaluated by the government on a four-tier scale is always outstanding or very near to that.

**LN:** We've been hearing a lot about NNSA's 2030 plan. What can you say about that?

**PW:** The complex is going to undergo a lot of fundamental changes long before 2030, but 2030 is a definition of where we want to be. It doesn't say that we're not going to finish until 2030; it says we're going to be on a journey. Complex 2030 has four key elements: transform the stockpile; transform the physical infrastructure; change the way we do business; drive science and technology. Those are the four main goals and if you look at the 2008 to 2012 budget you're going to see a lot of those elements addressed.

**LN:** To some extent, it seems like all of those things are being worked on right now.

**PW:** Yes, many of those things are being addressed already. As I said, this is a journey. I think Sandia has an exciting and unique role in the Complex 2030 initiative because you are the lead for technical services for systems integration

for Defense Programs and regardless of which Reliable Replacement Warhead option is selected, Sandia has a crucial role.

### Any chance of a BRAC-type process?

**LN:** As the weapons complex reorganizes, do you think there will be a Base Realignment and Closure-type process to reduce the number of facilities?

**PW:** My answer to that would be no. There will be some hard decisions, some politically difficult decisions, but I think there is enough synergy with individuals really wanting to improve the complex and understanding where we're headed for the future, that I think we'll be able to get there without a BRAC-type process.

**LN:** You and Tom Hunter recently signed the 2007 Performance Evaluation Plan. Does that address some of the issues you've talked about, issues regarding the model contract and the contractor assurance system?

**PW:** Yes, as a matter of fact, it does. We've got some items in there that are going to move us toward this new contractor accountability shift in federal oversight and I'm pretty excited about that.

On the larger issue of our relationship going forward, part of the Site Office mission is to help the Lab accomplish its goals, and the Site Office is here to assist whenever it can by clearing a path or shining a light from time to time to help Sandia get the job done.



# Mileposts

*New Mexico photos by Michelle Fleming  
California photos by Randy Wong*



Thomas Hunter  
40 1



James Rush  
40 10844

## Recent Retirees



Sherry Angelini  
32 8000



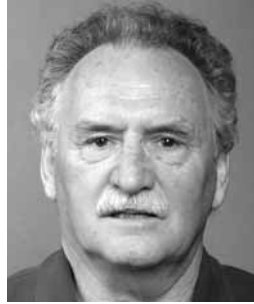
Richard Toth  
40 5925



Miles Clift  
35 8759



Diane Veca  
35 8949



Richard Brazfield  
30 2111



Ed Diemer  
32 8511



Judy Tejada  
30 8517



Richard Cernosek  
30 1744



Linda Gilkey  
30 2026



Dan Hardin  
30 8233



Renee Haynes  
30 8527



Carolyn Pura  
29 8136



Albert Lau  
23 8517



Sam Holmes  
30 4244



Danny Moniz  
30 8514



Charles Oien  
30 8940



Mary Tidwell  
30 10534



Greg Anderson  
20 10842



Ed DiBello  
16 5744



Cynthia Williams  
30 6039



Kenneth Black  
25 8134



Greg Foltz  
25 8112



Steven Kempka  
25 5535



Mary Clare Stoddard  
25 8125



Peter Van Blarigan  
25 8224



Kenneth Chavez  
20 5424



Scott Ferko  
20 8125



Jeff Jortner  
20 8963



Lilia Martinez  
20 4013



Craig Taylor  
20 8514



Martin Aragon  
15 6429



Barbara Charrette  
15 4338



Richard Dramer  
15 10856



Ramon Manzanares  
15 10842



Marianna Mauritz  
15 2125



Mary Padilla-Myers  
15 5525



Cynthia Richards  
15 8523



## Celebrating the life and ongoing work of Dr. Martin Luther King, Jr.

On Monday, Jan. 15, Sandians joined Americans around the country to mark the birth of Dr. Martin Luther King, Jr., the nation's revered disciple of nonviolence and the voice and moral anchor of the civil rights movement.

In one highlight of the local observance of the day, the Martin Luther King Multicultural Celebration, Sandia's Black Leadership & Outreach Committee and Community Involvement Dept. 3652 cooperated with the Dr. Martin Luther King, Jr. Multicultural Council to present \$1,000 scholarship awards to high school seniors. The awards were presented to students for 500-word essays on the topic of how Dr. King's words speak to them personally and to society as a whole. Lockheed Martin and Sandia are among the program's sponsors.

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Following is an excerpt from Dr. King's Nobel Prize acceptance speech (he had been awarded the Nobel Peace Prize for his work in the area of human rights.) The speech was delivered in Oslo on Dec. 10, 1964.

"I accept this award today with an abiding faith in America and an audacious faith in the future of mankind. I refuse to accept despair as the final response to the ambiguities of history. I refuse to accept the idea that the 'isness' of man's present nature makes him morally incapable of reaching up for the eternal 'oughtness'

that forever confronts him.

"I refuse to accept the idea that man is mere flotsam and jetsam in the river of life unable to influence the unfolding events which surround him. I refuse to accept the view that mankind is so tragically bound to the starless midnight of racism and war that the bright daybreak of peace and brotherhood can never become a reality.

"I refuse to accept the cynical notion that nation after nation must spiral down a militaristic stairway into the hell of thermonuclear destruction. I believe that unarmed truth and unconditional love will have the final word in reality. This is why right temporarily defeated is stronger than evil triumphant. . . .

"I have the audacity to believe that peoples everywhere can have three meals a day for their bodies, education and culture for their minds, and dignity, equality and freedom for their spirits. I believe that what self-centered men have torn down, men other-centered can build up. I still believe that one day mankind will bow before the altars of God and be crowned triumphant over war and bloodshed, and nonviolent redemptive goodwill will proclaim the rule of the land.

*"And the lion and the lamb shall lie down together and every man shall sit under his own vine and fig tree and none shall be afraid."*

"I still believe that we shall overcome."



FIRST FAMILY — Coretta Scott King, Yolanda Denise King, and Dr. Martin Luther King, Jr., on the steps of the Dexter Avenue Baptist Church in the spring of 1956. Coretta Scott King, who carried on her husband's work after his assassination in 1968, passed away in 2006.

## Latin jazz musician Danny Bueno is proprietor of Bueno's Snack Bar

He was a machinist and a percussionist. Today Danny Bueno runs Bueno's Snack Bar in Bldg. 800A outside Gate 1.

Bueno's Snack Bar was located in the Police Department building on Fourth and Roma in downtown Albuquerque for seven years before moving to Sandia almost four years ago. Danny keeps the shop open from 7 a.m. until 4:15 p.m., when he catches the bus.

Bueno's is stocked weekly by Deli Express with a variety of guaranteed-fresh burritos and sandwiches. The shop usually has apples, bananas, yogurt, breakfast bars, and muffins to start the day. "The cappuccino and fountain drink machines have proven very popular. I carry snacks that most small shops don't carry," he says. "I think my prices are competitive."

Bueno's also carries aspirin, Pepto-Bismol, and a variety of allergy medications. "Sandians make my job easier," he says, "so I try to anticipate their needs."

Fifty-six-year-old Danny began wearing



DANNY BUENO of Bueno's Snack Bar. (Photo by Randy Montoya)

glasses when he was five. As he got older, his eyesight grew progressively worse. Today he is 90-95

percent blind.

It depends on how the light hits you

"It is like living in a cloud," he says. "One day I can see your shape depending on how the sunlight is hitting you, others times I see nothing."

When his eyesight got worse, Danny attended Rio Hondo Community College in Whittier, Calif. He loved music and thought he could be successful. He became a percussionist, playing piano and congas with several Latin jazz bands in Whittier.

Danny and his wife Tina decided to move to a smaller city. He went to school at the New Mexico Commission for the Blind. Tina read all the books to him. His stepdaughter-in-law, Valerie Campos, helps him a couple of days a week.

"If you are a Raiders or Cowboys fan you can come in and commiserate," says Danny. "If your team has made you proud, it's OK. You can come in and gloat. It's all in good fun."

— Iris Aboytes

## Discover magazine recognizes Sandia physicist Mark Boslough

Discover magazine has recognized work done by Sandia physicist Mark Boslough (1433) as one of the "Top 100 Science Stories of 2006." More specifically, Mark's work is featured in the top eight earth science stories of 2006.

Boslough's Red Storm computer exercise that modeled an asteroid impact with the atmosphere over the Sahara Desert is featured in the January 2007 issue of the magazine.

Every year, Discover magazine selects 100 important and interesting science stories of the previous year to be featured in the special annual report.

Earlier this year, Boslough described in a documentary telecast on the National Geographic Channel the conditions that would have been required to create desert glass like the piece that is the central jewel in King Tutankhamen's pectoral jewelry.

Using Sandia's Red Storm — currently the second-fastest supercomputer in the world — Mark developed a simulation that suggests a 400-foot-wide stony asteroid slammed into the

Earth's atmosphere at 12 miles a second and exploded.

For 20 seconds, the resulting fireball would have been hot enough to melt quartz on the ground, creating the glass that can still be found in the desert.

"I had stumbled into the debate by accident in 1996, when I attended a conference in Bologna on the subject of the 1908 explosion of an asteroid or comet that knocked down nearly a thousand square miles of trees in Siberia," says Mark.

"I stayed an extra day to attend a meeting about the desert glass, where I argued that similar — but larger — atmospheric explosions could create fireballs that would be large and hot enough to fuse surface materials to glass, much like the first atomic explosion generated green glass at the Trinity site in 1945."

Mark described his journey to the Libyan Desert in Egypt for participation in the filming of the documentary in the Sept. 15 issue of the Lab News, "Riddle of the Desert Glass."

—Darrick Hurst



MARK BOSLOUGH

## Nominations will be accepted through Jan. 29 for ERA program

Nominations for individuals and teams in the annual Employee Recognition Awards program will be accepted through Jan. 29.

The ERA program recognizes excellence in four categories, three for individual nominees — technical excellence, exceptional service, and leadership — and one for teams whose exceptional achievements are critically enabled by



Exceptional service

Leadership

Technical excellence

teamwork and model the value of people working together toward a common goal.

Nomination forms with detailed instructions will be available from Sandia's internal web home page or at [www-irn.sandia.gov/era/07era.htm](http://www-irn.sandia.gov/era/07era.htm).

Each division has an ERA Coordinator who is also listed via the link above.

ERA individual winners and designated representatives from winning teams will be recognized at the Corporate Employee Recognition Night Banquet, Saturday, July 21.