

Cool flames for better engines



Sandia researchers use Direct Numerical Simulations to enhance efficiency, reduce pollution in diesel engines

By Sarah Sewell

A “cool flame” may sound contradictory, but it’s an important element of diesel combustion — one that, once properly understood, could enable better engine designs with higher efficiency and fewer emissions.

Sandia mechanical engineer Jackie Chen and colleagues Alex Krisman and Giulio Borghesi recently identified novel behavior of a key, temperature-dependent feature of the ignition process called a cool flame in the fuel dimethyl ether.

(Continued on page 5)

COOL HEADS — From left, Sandia researchers Giulio Borghesi, Jackie Chen, and Alex Krisman discuss a flame simulation. (Photo by Dino Vournas)



Back to the Grand Canyon 10

Inside ...

- Sandia Gives: What a dollar buys..... 2
- Annual Sandia Gives Book Fair begins Oct. 3..... 2
- Urban Shield emergency response exercise 3
- Tom Wildey wins DOE Early Career award..... 4
- Stewart Silling to edit new technical journal 5
- Upbeat groundbreaking for new computing center 7
- Six ways to reduce waste at Sandia 7



Sandia marks Hispanic Heritage Month .. 16

Painless microneedles extract fluid for wearable sensors for soldiers, athletes

By Mollie Rappe

The lab is calm and quiet, clean and well organized; boxes of tiny needles and sample tubes are neatly stacked above a pristine paper-covered countertop.

This is a far cry from the hectic emergency room, dusty battlefield, or sweaty training center Sandia and University of New Mexico researchers hope will soon host their microneedle-based sensors.

I am here, at this UNM lab, to participate in a research study to help these microneedles make that leap from basic research to helping soldiers on vital missions.

Ronen Polsky, a materials scientist who leads the design of the microneedle sensor, says the technology is the first way to extract large volumes of pure interstitial fluid for further study. In September, Ronen presented his vision and hopes for the microneedle-based sensor system at the Albuquerque TEDx conference.

Microneedles are a few hairsbreadths wide and can sip the clear fluid between cells in the middle layer of skin. This is below the topmost layer of dead skin cells and above the layer of skin where veins and nerves

(Continued on Page 4)



RIGHT TO THE POINT — Ronen Polsky positions a prototype 3-D-printed microneedle holder on the arm of Sandia science writer Mollie Rappe. Mollie participated in a clinical trial to see the best length of needle to extract the interstitial fluid on the path to track the physiological condition of soldiers, such as extreme exhaustion or dehydration. (Photo by Randy Montoya)



2017 EMPLOYEE RECOGNITION AWARDS. PAGE 12.

FAREWELL, PETE.

FORMER LABS DIRECTOR and Sandia President Emeritus C. Paul Robinson shares memories of working with New Mexico Sen. Pete Domenici, who passed away Sept. 13. Page 8.



That's that

The first time I met Pete Domenici, I was 18 years old. "Met" may be too grand a word for our encounter, but I always remembered it – there was something compelling, something charismatic about the man that stuck with me.

I was a student at the University of Albuquerque, a school Domenici himself had attended when it was called College of St. Joseph on the Rio Grande, which is now the campus of St. Pius X High School. I had enrolled in what at that time was an innovative between-semesters interdisciplinary course about the challenges of urban planning in late 20th century America. One of the speakers was an energetic young guy named Pete Domenici, who was chairman of the Albuquerque City Commission – the equivalent of mayor before Albuquerque restructured its city government.

I don't remember much about what Domenici had to say that day back in January 1969, although I'll never forget his remark that Albuquerque didn't have a smog problem – smog was a big concern in Los Angeles and other auto-centric coastal cities at the time – but a "smust" problem. Smust, he noted, was a combination of smoke and dust, a situation that could be addressed by paving more streets out on the fringes of the growing city. What I really came away with was a lasting impression about the man's conviction that smart public policy can make a real difference in the quality of life in a community. His message wasn't that he could solve Albuquerque's problems but that "we" could.

Even at my tender age, I knew Pete Domenici was destined to "be somebody." At that point, in fact, I would have been happy to see him elected as president. He was that impressive to a young man looking for inspired national leadership.

Now, fast forward six years. I was living out in the far reaches of the Washington, D.C., metro area, riding the Amtrak train into D.C. every day where I was working on a personal project at the Library of Congress. I'd left New Mexico a few years before, but as a political junkie I was quite aware that the impressive young Pete Domenici had been elected to the US Senate in 1972 from what was still my favorite state.

Anyhow, on the first day of what would end up being about a six-months-long daily commute, I noted that when the train made a stop somewhere in Montgomery County to pick up passengers, one of the first people to get aboard was Sen. Pete Domenici. And he was still impressive, not for anything he did on the train, but for what he didn't do. He didn't act like he was something special. Quite the contrary. Like every other busy commuter with a demanding job, he took a seat, opened his briefcase, and began going through papers, organizing and informing himself for the day ahead. I saw Sen. Domenici pretty much every day for the next several months, both of us just going to work.

When my wife and I moved to New Mexico in the early 1980s – for me it was a most welcome return – I read about Sandia from time to time (this was years before I was lucky enough to get a job here). The thing is, whenever I heard anything about the Labs, there was always some sort of connection to Sen. Domenici. He was very effective – and very vocal – at making the case for the Laboratories. That energetic young "mayor" of Albuquerque who made such an impression on me all those years before was still at work for the people of New Mexico and the nation.

My final reflection about Sen. Domenici is perhaps the most personally meaningful. A couple of years ago, the phone rang in my office. I picked it up and a voice I thought familiar said, "Hello, Bill, this is Sen. Pete Domenici. Do you remember me?" Of course I did; he'd retired a few years before but how could I, or anyone in New Mexico, forget?

He asked if I'd be interested in an essay he proposed to write exclusively for the *Lab News* about the importance of government investment in basic scientific research. I can't tell you how gratified I was that the former senator, who was now a senior fellow at the D.C.-based Bipartisan Policy Center, turned to the *Lab News* to publish his thoughtful piece (read it in the May 15, 2015, *Lab News* at <http://tiny.sandia.gov/jfsal>).

In tribute to Sen. Domenici, we've asked former Labs Director C. Paul Robinson to share his perspective on Domenici's contributions to Sandia and its ongoing relevance in provide exceptional service in the national interest. Read Paul's essay, accompanied by a selection of photos by Randy Montoya, on pages 8-9.

And now Sen. Domenici is gone. He has left us an enduring legacy, something to live up to. And the affectionate nickname we at Sandia bestowed upon him decades ago is today more apt than ever: Now he really is St. Pete.

– Bill Murphy (MS 1468, 505-845-0845, wtmurph@sandia.gov)



New Mexico Sandia Gives Campaign
Oct. 2-20

California Sandia Gives Campaign
Oct. 2-27

HOW YOUR DOLLARS MATTER



UNITED WAY OF CENTRAL NEW MEXICO

ONE DOLLAR A WEEK

\$52.00/YEAR
\$2.00 per pay period



Shoes and pants to prepare someone for work (Catholic Charities)



One hour of PTSD counseling for a victim of trafficking (Formation)



A calculator and SAT test prep book for a college-bound student in need (Working Classroom)

ONE DOLLAR A DAY

\$365.00/YEAR
\$14.03 per pay period



7 nights of lodging for a family, keeping parents close to their hospitalized child (Catholic Charities)



3 meals a day for 28 days for a mother and child escaping violence (Barrett)



6 months of one-on-one mental health treatment for one disabled veteran (Paws and Stripes)

FIVE DOLLARS A WEEK

\$260.00/YEAR
\$10.00 per pay period



40 books for students in an after-school tutoring program (APS Education Foundation)



3 months of formula, diapers, and baby supplies for a foster family caring for an infant with special needs (ARCA)



A weekly food basket for a homeless Veteran (NM Veteran Integration Centers)

FIVE DOLLARS A DAY

\$1,825.00/YEAR
\$70.10 per pay period



Financial literacy training classes and materials for 30 formerly homeless youth (New Life)



280 meals a year to someone who is hungry and struggling with social isolation (Meals on Wheels)



3 months of supported rent for a homeless youth transitioning from adolescence (New Day)

Exceptional service in the national interest

Sandia LabNews

<http://www.sandia.gov/news/publications/labnews/>

Sandia National Laboratories

Albuquerque, New Mexico 87185-1468

Livermore, California 94550-0969

Tonopah, Nevada • Nevada National Security Site

Amarillo, Texas • Carlsbad, New Mexico • Washington, D.C.

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Bill Murphy, Editor 505/845-0845

Randy Montoya, Photographer 505/844-5605

Patti Koning, California site contact 925/294-4911

Michael Lanigan, Production 505/844-2297

Contributors: Michelle Fleming (Ads, Milepost photos, 844-4902),

Neal Singer (845-7078), Stephanie Holinka (284-9227), Darrick

Hurst (844-8009), Heather Clark (844-3511), Sue Holmes (844-6362),

Nancy Salem (844-2739), Valerie Larkin (284-7879), Lindsey Kibler

(844-7988), Tim Deshler (844-2502), Mollie Rappe (844-8220),

Kristen Meub (845-7215), Michael Padilla (925-294-2447), Julia

Bernstein (925-294-3609), Jim Daneskiold, manager (844-0587)

Classified ads 505/844-4902

Published on alternate Fridays by Internal & Digital

Communications Dept. 3651, MS 1468

SANDIA GIVOS

Collective Goods

BOOK FAIR

OCTOBER 3-5
Steve Schiff
Auditorium Lobby
10:00 am - 3:00 pm

OCTOBER 10-12
Thunderbird Cafeteria
10:00 am - 3:00 pm

October 17-19
IPOC 2nd Floor Break Room
10:00 am - 3:00 pm

give.sandia.gov

Shop in the convenience of your workplace. Save on a big selection of books and gifts.

A percentage of the proceeds supports your local Community Fund.



Urban Shield 2017

Competing for their lives and ours

Sandia
Exceptional service in the national interest
CaliforniaNews

By Jules Bernstein
Photos by Dino Vournas

Three men armed with rifles take hostages at Sandia's California laboratory. You and your team have exactly 70 minutes to get as much information as you can about what's happening and safely defuse the situation. How would you respond?

That is the question participants in this year's Urban Shield emergency response exercise had to ask themselves. The event is part training, part competition among 35 local, state, national, and international SWAT teams. This year's exercise included groups from Taiwan, the Netherlands, the Department of Homeland Security, California Highway Patrol, and 28 Bay Area SWAT teams.

Over the course of 48 hours starting Sept. 9, the teams rotated continuously through each of 36 emergency simulation events set up at locations across the Bay Area, including one at Sandia's laboratory in Livermore.

Emergency Management coordinator John Norden describes Urban Shield as a test of stamina as well as decision-making, communication, and coordination skills. "At hour 40 into this event teams are still expected to make intelligent decisions. This is important training given that hostage negotiations can take that long," he says.

Even though teams used different tactics, Sandia emergency planner Rob Pedersen says the overall response to the Sandia active shooter scenario was admirable across the board. "All the teams moved quickly as soon as they heard the sound of gunshots. They did not hesitate — they were ready to go. A good thing, since excessive caution could cost lives."

Other scenarios included a hazardous materials emergency, a bomb scare, and tests of fire response, urban search and rescue, and emergency medical skills. The Alameda County Sheriff's Office hosted the teams and arranged logistics for the entire event.

Coordinating with local law enforcement is especially useful for Sandia's Protective Force, according to emergency planner Anthony Trimble. "The planning process during Urban Shield is important for building relationships, so when an emergency really does happen on our site, we are not seeing each other's faces for the first time," he says.

This year, event observers named Sacramento Police Department SWAT as the top response team, followed by Oakland and San Francisco police teams in second and third place, though all teams showed a high level of preparedness.

In addition to the important coordination and response work, the many volunteers who act as victims help make the scenarios feel more realistic. Anthony says he hopes that next year more members of the workforce will opt to participate in Urban Shield and in the other emergency response exercises conducted on campus. If you would like to get involved, contact John Norden or anyone on the emergency management team.



CENTRAL California SWAT team members include police officers from San Ramon, Martinez, and Walnut Creek.



UNIVERSITY OF CALIFORNIA, Santa Barbara police are searched prior to entering the exercise "hot zone."



HAYWARD POLICE navigate the entrance of a building involved in a simulated active shooter incident.



HAYWARD POLICE SWAT team evacuates "hostages" inside the building.



UNIVERSITY OF CALIFORNIA, Santa Barbara police take down two hostile intruders.

Microneedles

(Continued from page 1)

reside. The clear, colorless fluid is called interstitial fluid and is similar to blood plasma.

Microneedles continuously sample interstitial fluid to track physiological conditions

The microneedles can contain minuscule sensors or extract the interstitial fluid for further testing. Because microneedles are tiny and don't go very deep, they're practically painless. When five microneedles clasped in a 3-D printed holder were inserted into my forearm, I felt a little pain. It was less than a standard needle prick and faded quickly.

For the study I participated in, the needles were left in for 30 minutes and three different lengths of needles were tested to determine the proper length to extract interstitial fluid from me.

Since the needles are painless and minimally invasive, they could be left in for hours or even a whole day without irritation, allowing constant monitoring, says Ronen.

Continual sampling of important biomarkers in this interstitial fluid could help monitor and diagnose many diseases and disorders. These markers include electrolytes, salts such as potassium and sodium that get out of balance during dehydration; glucose, a sugar that diabetics need to monitor constantly; and lactose, a potential marker of physical exhaustion or life-threatening sepsis.

Diabetes, dehydration, and exhaustion biomarker detection

A small, wearable sensor that can monitor these markers could have many uses. It could help endurance athletes meet their training goals without plunging into dehydration or severe exhaustion. Tracking their physiological conditions would aid soldiers on strenuous missions, alerting them before they get so exhausted it could compromise their objectives. Ronen suggests that the microneedle sensor could also be part of a sense-and-respond device that detects high glucose levels and automatically delivers insulin.

"To move toward something that is market-ready, you need to start adding components that make it a bit more user-friendly and increase the reproducibility of the readouts," says Philip Miller, a Sandia biomedical engineer also involved in designing the sensor.

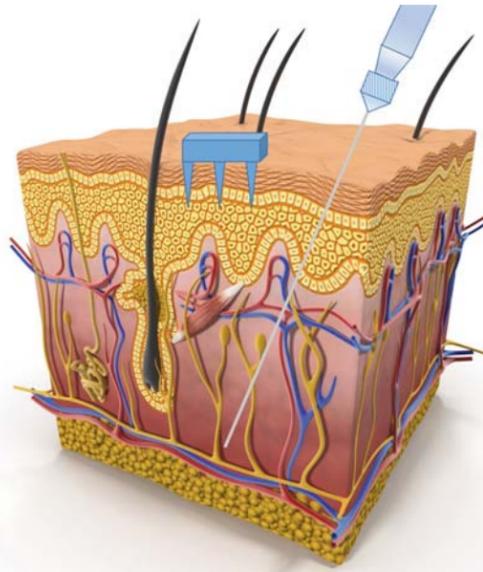
Or the sensors could be used in emergency rooms and critical care facilities to determine which salts are out of balance in cases of severe dehydration or track the response of a septic patient to a course of antibiotics, says Dr. Justin Baca, assistant professor of emergency medicine at UNM who leads the human testing of the sensor.

"There are a lot of great uses for these microneedle sensors," says Baca. "They have the ability to help a lot in the medical sphere and in national security, but they could also be something that's useful to somebody who's just trying to improve their performance as a cyclist."

1.5-millimeter-long needles extract interstitial fluid

The goal of the first research study in humans was to determine the best length of needle to extract the most interstitial fluid from healthy volunteers and then compare the contents of the interstitial fluid to blood.

"Now we have a pretty good sense of what the average length we should use for most people, but some people's skin is a little thicker or a little thinner in that area and the flow rate may be decreased," says Baca. Typically the best microneedles are



TINY MICRONEEDLES sip fluid in the middle layer of skin between the layer of dead skin cells and above where veins and nerves reside. Therefore, they're far less painful than traditional hypodermic needles.

"There are a lot of great uses for these microneedle sensors. They have the ability to help a lot in the medical sphere and in national security, but they could also be something that's useful to somebody who's just trying to improve their performance as a cyclist."

— UNM physician Justin Baca

1.5-millimeter long, about as long as a US penny is thick.

I'm pretty thick-skinned, and this study proves it. The 2-millimeter long microneedles extracted more interstitial fluid from me than the 1.5- or 1-millimeter long needles.

In addition to the salts and sugars with well-studied roles in physiological monitoring, interstitial fluid contains many proteins and exosomes, free-floating balls carrying genetic information including cancer markers.

More research is needed to unravel everything these components can signal, but Ronen says he hopes someday interstitial fluid will join blood and urine as a fluid doctors routinely test for their clinical diagnoses. That's the focus of the study I participated in.

After Robert Taylor, a postdoctoral fellow who works with Baca at UNM, cleaned my forearm with an alcohol wipe, he pressed the third five-needle holder into my arm. There was a brief jolt of pain and pressure similar to tugging on strands of hair. Then, except for the fact that I was asked not to move my hand and someone was pressing a finger-sized piece of plastic against my arm, I hardly noticed it. Future sensor systems will be set up to be simpler to use, says Taylor.

After about 10 minutes, I saw clear, water-like liquid seeping out of me, into tiny glass straw-like capillaries. In 30 minutes, the five microneedle-capillaries collected about 2 microliters, or 1/30 of a drop.

Wearable sensors, early cancer detection, bright future of microneedle-based sensors

For many applications the researchers envision, the biomarker sensors would be on the very tip of the microneedle to allow continual detection of the condi-

tions inside the body. Future studies will use larger needle arrays to increase sample volume. For other applications, such as early cancer detection, collecting the interstitial fluid may take longer than a standard blood draw, but could provide different clues.

Future work includes testing the tip-based sensors in people — they've already shown it works well in solutions — and then monitoring the lactate levels in people undergoing strenuous exercise.

In June, the researchers announced interest in business partners to help integrate the microneedle sensors into a self-contained device. The ultimate goal of commercialization or a partnership with industry would be to get the technology to the market in a way that benefits the public.

The initial work on the sensor was funded by Sandia's Laboratory Directed Research and Development program. The US Defense Threat Reduction Agency is funding the human studies.

After four 30-minute interstitial fluid collections, my part is done. The red marks from the needle holder fade after a few hours but the satisfaction of helping science lasts much longer. Baca's team will conduct various tests on my interstitial fluid, bringing them one step closer to microneedle-based sensors for patients, soldiers, and athletes.

Sandia computing researcher Tim Wildey wins DOE Early Career Research Program Award

By Neal Singer

Tim Wildey has received a 2017 Early Career Research Program award from the DOE Office of Science.



TIM WILDEY

"Tim is the first Sandia winner of the Advanced Scientific Computing Research branch of the prestigious program," says manager Daniel Turner.

The national award, now in its eighth year, provides researchers a grant of \$500,000 yearly for five years. Its intent is "to identify and provide support to those researchers early in their careers who have the potential to develop new scientific ideas, promote them, and convince their peers to pursue them as new directions," according to an Office of Science reply to "Frequently Asked Questions."

Tim's proposed research seeks to develop data-informed multiscale modeling and simulation that will be mathematically consistent and more robust than current practices.

His research over the past few years has focused on developing mathematical and computational frameworks that quantify the amount of uncertainty present in a problem. That uncertainty is then included in his mission-related modeling and simulation.

Tim anticipates that using complex multiphysics applications to inform high-consequence decisions will require moving beyond forward simulation — the prac-

tice of assuming all a model's input parameters are known and then using the model to make predictions about objects of interest.

"Moving beyond forward simulation means that we no longer assume that we precisely know these model inputs and we instead seek to infer information about them from experimental data," he says.

"Many problems in materials science, subsurface flow and mechanics, and magnetohydrodynamics are best described by multiphysics, which involves multiple physical models or multiple physical phenomena, and multiscale models," he says. "These problems are challenging to simulate because they incorporate detailed physical interactions across a wide range of length and time scales. This research will pursue mathematically rigorous and computationally efficient approaches for predicting the properties and behavior of realistic, complex multiphysics applications."

His proposed integration of advances in numerical discretization, uncertainty quantification, data assimilation, and model adaptation should result in models that can better predict outcomes.

Says Tim, "This project integrates some of that foundational work with ideas we've been exploring at Sandia to benefit a wide range of mission applications that support the science and national security missions of Advanced Scientific Computer Research and the DOE."

Tim joined Sandia in January 2011 after a postdoctoral fellowship at the University of Texas at Austin and receiving a master of science and doctorate at Colorado State University, and a bachelor's degree at Michigan State University, all in mathematics.

DOE Early Career grants are available in the program areas of advanced scientific computing research, biological and environmental research, basic energy sciences, fusion energy sciences, high energy physics, and nuclear physics.

Cool flames

(Continued from page 1)

The adjective cool is relative: The cool flame burns at less than 1,150 Kelvin, about half the typical flame burning temperature of 2,200 Kelvin. While cool flames were first observed in the early 1800s, their properties and usefulness for diesel engine design have only recently been investigated.

“We’re trying to quantify the influence of cool flames in stratified turbulent jets during the ignition and flame stabilization processes. The insights gleaned will contribute to more

efficient, cleaner burning engines,” says Jackie. “Our holy grail is to understand the physics of turbulent mixing coupled with high-pressure ignition chemistry to aid in developing predictive computational fluid dynamics models that can be used to optimize engine design.”

The team’s research has shown that during autoignition (the spontaneous ignition of injected fuel in a combustion engine), cool flames accelerate the formation of ignition kernels — tiny localized sites of high temperature that seed a fully burning flame — in fuel-lean regions. The work was performed at Sandia’s Combustion Research Facility using Direct Numerical Simulations (DNS), a powerful numerical experiment that resolves all turbulence scales, and was published in the *Proceedings of the Combustion Institute* with Alex as the lead author. The work was supported by DOE’s Office of Basic Energy Sciences.

Giulio further extended the cool flame DNS study by performing a three-dimensional study on n-dodecane, a diesel surrogate fuel that has been the recent focus of Sandia’s Engine Combustion Network on spray combustion in diesels (the study that Alex authored with dimethyl ether, a simpler fuel, was in two dimensions). Giulio’s paper is pending publication. Taken together, both Alex’s and Giulio’s papers will form a comprehensive study of low-temperature chemistry in autoignitive flames at different stages of ignition.

Cool Flames Can Improve Engine Design

The details of starting an engine often are taken for granted. Unlike a gasoline engine, in which the fuel-air mixture is ignited with a spark plug, in a diesel engine the fuel must auto-ignite when it is injected into the hot, compressed air that is in the piston at the top of the piston stroke. As the fuel is injected into the engine cylinder, rapid mixing and combustion combine to burn the fuel and drive the engine. While this lasts mere fractions of a second, the conditions of the flame that start this powerful process

are crucial for improving engine efficiency and minimizing pollution formation.

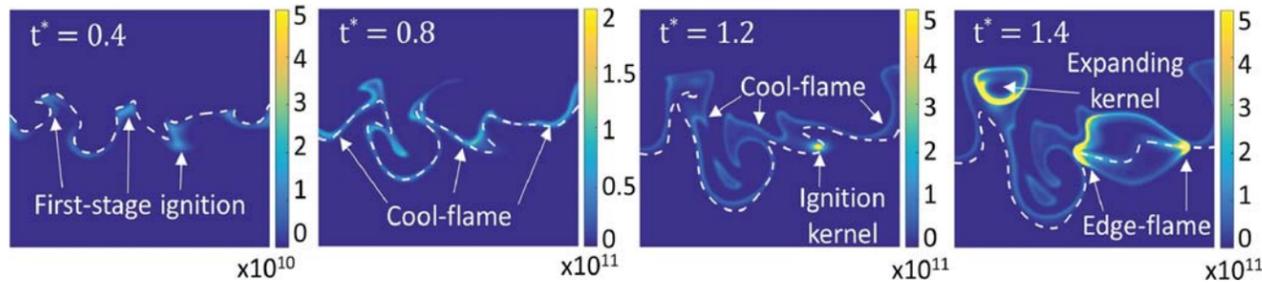
In a diesel engine, the fuel-air mixture is far from uniform, with some regions having high fuel concentrations and low temperatures and other regions having low fuel concentrations and high temperature. In other words, the in-cylinder condition is highly stratified. Alex and his coworkers discovered that stratification, combined with the complex ignition chemistry of the diesel-like fuel, create a fast-moving cool flame that controls the overall ignition behavior.

The rapid movement of the cool flame decreases the time needed for ignition, which is important when operating an engine with significant flue gas recirculation, a technique used to decrease soot and nitrogen oxide emissions and increase engine efficiency.

“The cool flame triggers the hot ignition,” says Alex. “This causes the hot ignition timing and location to be markedly different to what would be otherwise

expected. This discovery should improve our understanding of the very complex diesel ignition process.”

The cool flame DNS studies were performed at the DOE’s Oak Ridge Leadership Computing Facility on Titan, a 27-petaflop super-computer, using a



DIRECT NUMERICAL SIMULATION shows the heat release rate of the first stage of autoignition of dimethyl ether. The first stage is initiated in fuel-lean mixtures (areas of the fuel mixture where there are low concentrations of fuel) and the cool flame that is created moves into richer mixtures as autoignition progresses (t^* represents time, colored scale represents the heat release rate in W/m³).

DOE INCITE computational grant (Innovative and Novel Computational Impact on Theory and Experiment). Computations using some of the world’s largest supercomputers, such as Titan, are required to produce an accurate and detailed calculation of the autoignition process.

“Combustion processes are challenging to study because the fuel itself is quite complicated,” says Giulio. “Fuel oxidation chemistry consists of hundreds of species and thousands of chemical reactions. A realistic simulation of diesel combustion needs to capture this complex chemistry accurately in an overall model that includes turbulent mixing and heat transfer.”

As part of the DOE Exascale Computing Program, the team collaborates with outside institutions including NVIDIA, Lawrence Berkeley National Laboratory, National Renewable Energy Laboratory, Stanford University, Oak Ridge National Laboratory, Argonne National Laboratory, and Los Alamos National Laboratory to develop performance-portable algorithms to enhance the computing efficiency for DNS combustion studies.

Future Work

In the future, the team would like to investigate basic questions about the speed and structure of flames at diesel engine conditions and study the relationship between spray evaporation, ignition, mixing, and soot processes associated with multi-component fuels. These basic questions will contribute to studying the cool flame’s crucial role in engine energy production and exercise the valuable capabilities of DNS running on exascale supercomputers as a highly precise and detailed numerical simulation method.

Sandia’s Stewart Silling to co-edit new technical journal

By Sue Major Holmes

Standard equations for solid mechanics aren’t well-suited to complex problems such as modeling cracks in materials. So Sandia’s Stewart Silling worked to generalize those equations to make them mathematically compatible with today’s needs.

French mathematician Augustin-Louis Cauchy proposed the standard equations for analysis in the early 1800s. But Stewart says they’re not up to the challenges of modern technology, such as modeling nanoscale interactions or how complex materials deform and fail.



STEWART SILLING

Now he and University of Arizona aerospace and mechanical engineering professor Erdogan Madenci have been named co-editors-in-chief of a new publication, the *Journal of Peridynamics and Nonlocal Modeling*. It will be published by Springer, part of Springer Nature, one of the largest publishers of scientific journals.

The publication will give those working on the theory a forum and access to reviewers who understand the nuts and bolts of it, Stewart says. Madenci, who calls peridynamics a game changer in mathematics and mechanics, says the journal will create a platform to showcase new applications and advancements, promote growth in peridynamics research, and attract exceptional researchers and graduate students.

The first issue is tentatively scheduled for January 2019 to allow enough time to solicit and review papers.

Other Sandia researchers have been editor-in-chief of publications, but a new journal that developed from an idea that began at Sandia “doesn’t happen every day,” Stewart says. He says Madenci proposed the journal.

A pioneer in peridynamics

Stewart started working on peridynamics in 1998, making him a pioneer in the field. He spent a year at Caltech as a visiting faculty member on temporary assignment from Sandia, which gave him time to develop a generalized theory. He published his first peridynamics paper in 2000. The US Association for Computational Mechanics awarded him the Belytschko Medal in 2015 for outstanding and sustained contribution to computational solid mechanics.

Peridynamics is useful for such areas as structural mechanics, impact and penetration mechanics, shock waves, predicting materials failure, fracking, and composite materials. “The theory is being applied to problems as diverse as additive manufacturing, fragmentation of munitions, aging of concrete structures, bird strikes against aircraft, erosion of high-temperature ceramics, cracking of car windshields, and even the spread of cancer cells,” says Stewart, who has been with Sandia 27 years.

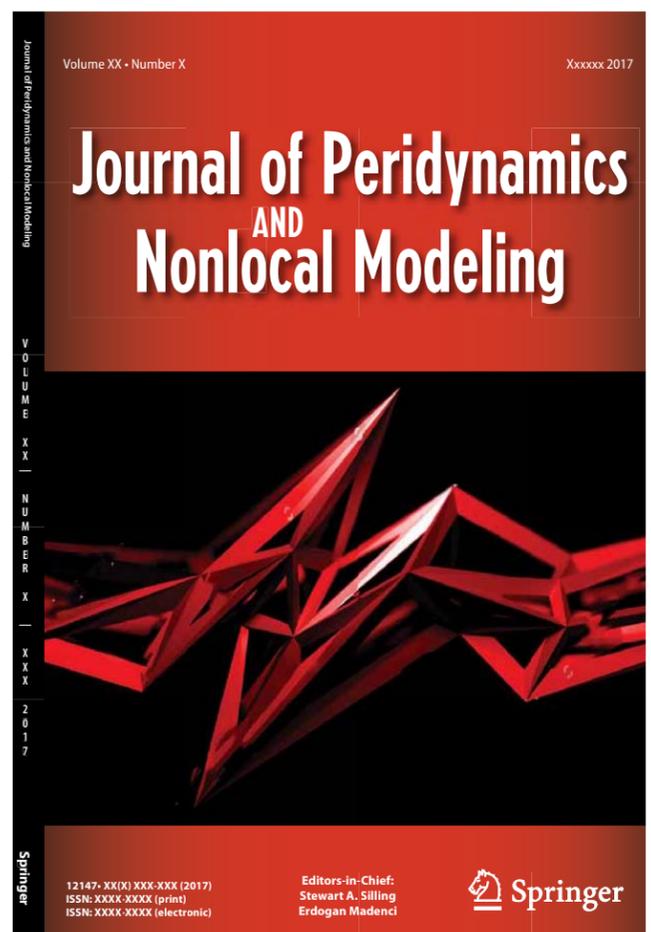
Research groups worldwide are developing the theory and its applications and it has been implemented in computer codes that model fracture in various problems, Stewart says. “There are still difficulties remaining with the new theory, but people are starting to recognize its potential,” he says.

The journal plans two issues the first year, each with a dozen papers. “Based on the global interests of this emerging area, we anticipate the number of journal submissions to steadily multiply, inspiring new ideas, further discussions and continued exploration,” says Melissa Fearon, senior

editor at Springer.

“It was exceedingly evident from our correspondence with scientists in the community that both Stewart Silling and Erdogan Madenci possess the precise qualifications to steer the editorial leadership of this new journal,” she says.

Sandians David Littlewood and Michael Parks serve on the journal’s editorial board.



The proposed cover for the new *Journal of Peridynamics and Nonlocal Modeling*, with the first issue scheduled to be published in 2019.

SANDIA GIVES

Annual ECP and SHARE campaigns join forces to serve our communities

Make a difference where you live and work

NM campaign is Oct. 2-20 • California campaign is Oct. 2-27

The Sandia Gives Campaign is the Labs' annual opportunity to come together and act with the common goal to help our communities through the United Way. For more than 60 years, Sandians have generously volunteered their time and given of their resources to change lives and help our local communities in profound ways.

The United Way of Central New Mexico's Community Fund helps those most vulnerable through program grants to qualifying health and human service agencies. The Community Fund supports programs that advance education, health, and self-sufficiency, improving the lives of more than 250,000 of our neighbors. The grants currently support 104 projects and programs, totaling \$3.6 million. APS Clothing Bank, NMCAN, and the Rio Grande Food Project are just a few of the programs that are able to provide life-improving services because of Sandia's contributions.

Albuquerque Public Schools Clothing Bank provides clothes, shoes, socks, and underwear to students in need so they can focus on learning



The APS Clothing Bank partners with Goodwill Industries of New Mexico to make sure students can choose their own clothes as many as three times per year. Sandia helps the clothing bank through the annual Shoes for Kids Program that last year raised enough money to give local families 600 gift cards to take their kids shopping at Payless Shoe Source.

A liaison from an elementary school contacted the APS Community Clothing Bank seeking urgent help for a family whose children had just enrolled in the school. Two students arrived in Albuquerque from Las Cruces with their mom, fleeing a domestic violence situation. They picked up and left without most of their belongings, including all of their clothes. Packing could have tipped off their abusive parent that they were about to leave. The APS Community Clothing Bank rushed over a package including clothing and shoe vouchers to help the family. The school liaison helped the mother find the nearest Goodwill and Payless Shoe Source stores and helped her with bus routes to reach them.

The next week, the boys came to school wearing new shoes and clothes. With so many challenges already facing them in a new school and city, their clothes were no longer holding them back. It was the beginning of a positive relationship between the parent and the school. In a time of great stress, the APS Community Clothing Bank was there to help a family in crisis.

NMCAN improves transition into adulthood

Young people aging out of foster care endure poor outcomes with high social costs. At age 18, they leave the system without the life experiences and necessary family supports to become successful adults.



National data provided by the Annie E. Casey Foundation shows that by their 19th birthdays, 1 out of 3 experience homelessness, 3 out of 5 have not obtained their high school diploma/GED, and 2 out of 3 are unemployed.



NMCAN HELPS YOUTHS transitioning to independent living from foster care and/or the juvenile justice system achieve successful outcomes.

The Brookings Institute estimates Central New Mexico is home to 8,300 young people ages 17 to 24 who are disconnected from their community, school, and work. NMCAN works to address these challenges by improving their transition to adulthood.

Sandia employees help support kids in the foster care system with the annual Holiday Gift drive. Last year, more than 900 kids in foster care received gifts courtesy of Sandia employees. The older children that receive services from NMCAN asked for hoodies, gift cards, and electronics, which Sandia's generous workforce happily provided.

Megan first connected with NMCAN several years ago when she was on the verge of aging out of foster care. After some initial reluctance, Megan became involved with NMCAN programming, which led to the development of having a safe and supportive community around her. She participated in Opportunity Passport — a comprehensive financial literacy and asset-specific training — a few years ago, and with the support of NMCAN, she identified financial goals to pay off student loans. In 2016, Megan received her bachelor's degree in psychology from the University of New Mexico and works at a local health-care organization. With the support of Opportunity Passport, Megan was able to purchase her first home. After experiencing the constant transition of foster care, Megan is leading a stable life surrounded by her chosen family in a home of her own. "I live a pretty busy life so this extra help is a tremendous blessing!" Megan says. "Thank you just oh so much from the very bottom of my heart!"

Rio Grande Food Project works to prevent and end hunger for adults and children in the Albuquerque metro area

The Rio Grande Food Project (RGFP) is the largest food pantry on Albuquerque's West Side located in a "food desert" area where many people do not

have regular access to enough affordable nutritious food. Hunger is a chronic condition in New Mexico, which ranks 2nd among all states in childhood hunger and 7th in hunger overall. In Bernalillo County, 1 in 6 residents do not know where their next meal will come from. At RGFP, hungry households can pick up a week's worth of food once a month.

Denise (not real name) was living near Ruidoso earlier this year and got laid off from her job. The same month, her eldest son was tragically killed by a car while crossing the street. Denise was left with a broken heart, more bills than she could pay, her 16-year old son, and three small grandchildren whose mother left after their father died. The youngest grandchild is deaf and requires continuous medical attention. Since there were few jobs in the small town where they lived, and there was no medical attention for her deaf grandson, Denise moved her family to Albuquerque. They had almost nothing when they were referred to the Rio Grande Food Project. On their first visit, they learned that they could pick up a week's worth of groceries to fill their empty bellies. They could also get a free emergency phone, enroll in Medicaid, and have their health screened by Blue Cross Blue Shield. For the first time in a long time, Denise felt some relief and was grateful for the emergency support. She planned to return every month until they were back on their feet.



"We make it convenient for employees to participate," says Roberta Rivera, Sandia Gives program coordinator. "Our community faces so many serious challenges and when I see what we can do together as employees of the Labs, I'm so inspired that we really can and do make a difference." Sandia's executive management is supportive and engaged in this year's campaign and more than 60 employee volunteers serving as Line representatives are ready to answer questions and help communicate the importance of Sandia Gives.



MEMBERS OF THE RIO GRANDE FOOD PROJECT team are committed to ensuring that everyone in the community has regular access to nutritious and affordable food.

Shovel-ready: Upbeat groundbreaking for multi-petaflop computing center



ON YOUR MARK, GET SET . . . Eager to plunge into their symbolic breaking of bare ground to upthrust a new computing center are, left to right, Carol Meincke, Steve Fattor, Grant Heffelfinger, Dave Douglass, Tom Klitsner, Scott Collis, Carol Jones, Scott Aeilts, John Zepper, and Betty Payne. (Photo by Lonnie Anderson)

By Neal Singer

Under gray skies, on a gravelled lot enclosed on three sides by chain link fences and, on the fourth, a 30-foot-high wall of aluminum siding, a group of perhaps 30 Sandians and a few outside contractors listened expectantly as Tom Klitsner of Sandia's mission computing organization and computing research center director Scott Collis described benefits from the ultra-modern computer annex expected shortly to be erected there.

"Thanks for joining us on this great occasion," said Tom. He went on to invoke a Sandia benchmark of note — the Red Storm supercomputer, built and housed in the early 2000s in the building behind the aluminum wall.

"It was one of the most influential supercomputers ever. It was copied many times over, and its design changed the way supercomputers were built. We believe this new facility will [house machines similarly influential], not just for Sandia but for the HPC community in

"[Red Storm] was one of the most influential supercomputers ever. It was copied many times over, and its design changed the way supercomputers were built. We believe this new facility will [house machines similarly influential], not just for Sandia but for the HPC community in general."

general," Tom said.

Said Scott of the multi-petaflop computer the facility is intended to contain, "We refer to it as a prototype but it's also going to be a large system, as much as a hundred times faster than Red Storm in performing large-scale weapons simulations."

The building will house all future Sandia high-performance computing systems.

Funded institutionally, the building is expected to be completed in the summer of 2018 at a cost of approximately \$10 million.

New building technology, based largely on techniques explored by Sandia data center engineer David J. Martinez and collaborators, is expected to use the most advanced tools to minimize water and energy use. Green-building construction and an external solar panel field, are expected to be good enough to achieve LEEDS certification.

At the ceremony's close, rather than champagne toasts, the researchers — most dressed "engineer-casual" in jeans and short-sleeve shirts — and executives picked up 12 gold-painted shovels to displace a pile of dirt and by doing so, signify their intent to mold the vacant lot to their vision.

Carol Meincke, who five years earlier began assisting Tom with initial planning of the project, called to the audience, "Let's start digging before it rains!"

It was a happy beginning.

SIX SIMPLE WAYS TO REDUCE WASTE AT SANDIA

TIP 1: AVOID BINDER WASTE
Avoid purchasing non-recyclable binders for printed information that can be easily kept current if stored on the corporate network. Consider reusing binders where possible from one of the binder reuse locations.



TIP 2: MINDFUL PRINTING
That meeting agenda that will be discarded shortly after the meeting probably doesn't need to be printed. Do you need a new printer in your office, or can you use a locally networked printer?



TIP 3: ASSESS THE NEED FOR CALENDARS
How much do you use that printed calendar? If it's not much, consider skipping it for this year.



TIP 4: RECYCLE
Find out where the different recycle bins are located in your building. Things such as paper, plastic utensils/bottles, aluminum cans, batteries, glass, and even that morning keurig cup can all be recycled.



TIP 5: REUSE CUPS/CONTAINERS
Bring coffee cups, utensils, and reusable food containers from home. Also the NM cafés currently offer reusable cups for hot and cold beverages, and will soon be offering reusable food containers too.



TIP 6: DUMP OUT LIQUIDS
Liquids that find their way into the landfill are dangerous because they can create a nasty "leachate," a liquid that can absorb and transport other toxins from the landfill to places you don't want them, such as the aquifer.



GO TO ZEROWASTE.SANDIA.GOV FOR MORE INFORMATION



Saying goodbye



SEN. PETE DOMENICI stands in front of the National Security Innovation Center Building after the dedication in his honor.

A Remembrance of Senator Pete V. Domenici

Ambassador C. Paul Robinson was Sandia President and Laboratories Director from 1995 to 2005. He previously served as head of delegation and chief negotiator for the United States in successful arms control talks with the Union of Soviet Socialist Republics.

In his roles as Labs Director and ambassador, Paul worked closely with Sen. Pete Domenici, widely respected among his peers as perhaps the most knowledgeable lawmaker in Congress on matters related to nuclear weapons, science, and technology. In the essay below, Paul shares some thoughts about his friend and associate, Sen. Pete V. Domenici, who passed away Sept. 13.

**By Ambassador C. Paul Robinson
President Emeritus of Sandia National Laboratories**

Sen. Pete Domenici's leadership in New Mexico, in Senate and congressional committees, and in the full Senate are well-known and have been widely remarked upon both during his career and in the many tributes about his passing. In this brief note, I want to emphasize how and why he was able to realize so many accomplishments of profound national importance.

Throughout his career, Sen. Domenici cultivated close ties to Los Alamos National Laboratory and Sandia National Laboratories, becoming arguably the best-informed national legislator on the complex issues of science and technology for national defense and nuclear energy. His openness to learning and understanding new things and the uncommon common sense that he brought to difficult technical issues made him the natural leader on these subjects in the US Senate.

Over the years, as he moved into the powerful posts of chairman of the Senate's Energy and Water Development Subcommittee and then chairman of the Senate Energy and Natural Resources Committee, he became the most important legislator for all things nuclear.

Sen. Domenici's access to some of the nation's best physicists, engineers, and other scientists gave him a stable of instant advisers on many difficult issues. He established advisory groups (especially between Los Alamos and Sandia) to brief him, keep him informed, and help him develop the best answers for tough questions.

Very early in his career, Sen. Domenici learned that you must get the science right. In fact, he became quite outspoken on what he called "pure silliness" — that is, when unproven scientific theories are used to foster fear in the populace.

He took on several of these, such as the public hysteria over eating irradiated foods, a technology that if deployed could prevent most of the 5,000 deaths that still occur

each year from food-borne diseases (e.g. *e. coli*). He often pointed out that "all of the astronauts' food is irradiated to help ensure they don't get sick in space!"

As Sen. Domenici's knowledge, reputation, and stature grew, he became the leader in Congress on strategic deterrence issues. He often negotiated with presidents of both parties over these tough issues, and was frequently brought in by US presidents to help advance sensitive Summit discussions. Although he didn't like to travel, these discussions often required Sen. Domenici to travel to Moscow to break deadlocks over vital issues. He played a particularly important role in helping rescue the uranium and plutonium disposition agreements between the US and Russia. As a result of his personal leadership, today more than half of the uranium fuel used in US nuclear power plants comes directly from retired Russian nuclear weapons (with more than 25,000 weapons disposed of), by the US buying these materials. The programs Sen. Domenici created are modern classics of "forging swords into plowshares" and have been transformational to the wider world.

Sen. Domenici also often provided key leadership on major national security issues here at home. He provided critical insights for issues that: involved nuclear weapons and their delivery systems; involved the institutions that designed and developed them; developed the policies for their deployments; and provided the funding that sus-



SEN. PETE DOMENICI and then-Labs Director C. Paul Robinson share a light moment at Sandia's Steve Schiff Auditorium in 2005.

tained them. He deserves enormous credit for his leadership on these issues throughout his tenure. Few outside the nuclear weapons programs know the debt of gratitude the nation owes Sen. Domenici for his devotion to, and effective leadership of, this vital work. His superior knowledge on the issues, coupled with his well-earned reputation for prudence in spending taxpayer moneys, gave Sen. Domenici's views even greater weight.

I encourage young people in our nation to study the model of national service which Sen. Domenici's life exemplified, and I would hope that those students would then seek to become (or at least elect) senators like Pete Domenici. As I always said: "He became the prototype of what we all should want in a United States senator."

A transformative experience at Sandia

Pete Domenici was a great American and in my relationship with the senator he was a man who cared very deeply for our nation and gave seemingly more than 100 percent each day to his work on its behalf.

From the very first time I met him it was clear to me he was driven by a tireless desire to help shape a better future — for state and nation alike. He worked very hard on each issue and always asked tough questions about long-term results: "Where do you think this could lead? Tell me if you think I'm taking the right view of this?"

He was devoted to improving the future for all.

Once, on one of his visits to the Laboratory, (with the prior consent of our highest DOE official, who would be coming along with Pete on the visit to Sandia), I got approval to "read-in" Sen. Domenici into one of our closely held programs. The senator's reaction was transformative: "My God, I knew you people did important work, but I never could have guessed that it was something like this."

In the years that followed, he would remind me of how thankful he was that we had communicated such information to him, saying, "I always held you folks in high esteem, but I take so much more pride now in knowing in how valuable you can be to all of us — and knowing what it really meant to have supported you so strongly over the years."

That is the memory of "St. Pete" that I will always carry.

— C. Paul Robinson

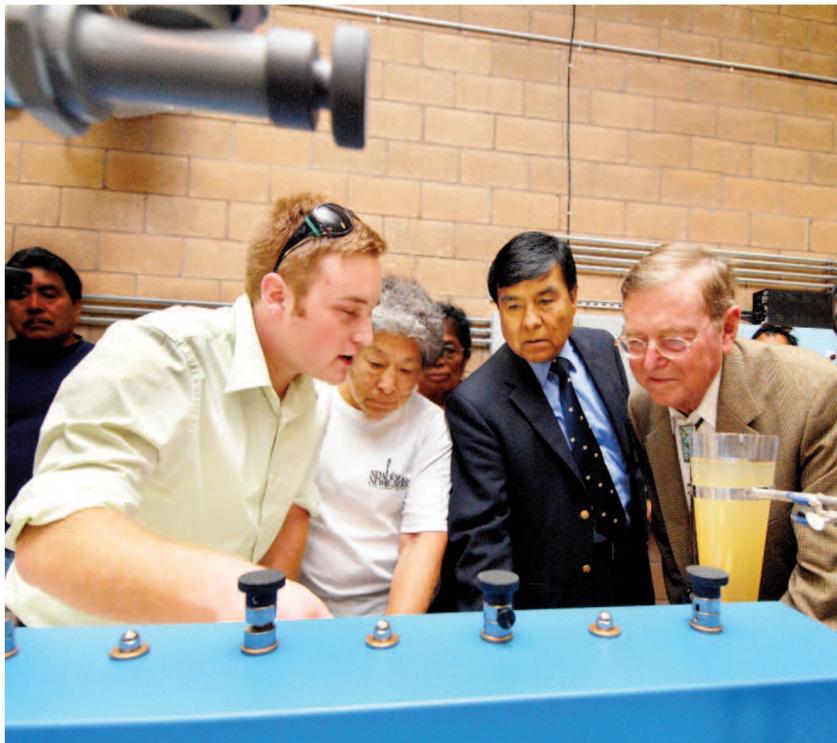


AT THE SOLAR FACILITY — Sen. Jeff Bingaman, Sandia President Tom Hunter, Sec. of Energy Sam Bodman, President George W. Bush, and Sen. Pete Domenici tour the facility after signing the 2005 Energy Bill.

Photos by Randy Montoya



Z MACHINE — Sen. Domenici and Keith Matzen look over some archival photos at the dedication of Z from PBFA 2.



IN 2006, SEN. DOMENICI and tribal officials of Jemez Pueblo learned about the efforts of Sandia researchers in arsenic remediation.



A SENATOR AND A PRESIDENT — Sen. Pete Domenici and Sandia President Morgan Sparks walk together in front of Bldg. 800 in this 1974 photograph. (Sandia archival photo)

Steve Younger tribute

"We say farewell to Pete, but he will always be a part of Sandia. The Pete V. Domenici National Security Innovation Center stands witness to his belief that Sandia, along with the other national laboratories, will continue to provide science and engineering in support of critical national security needs. It stands witness to his long-term vision for the security of our nation, a vision for a safe, secure, and reliable nuclear deterrent. Thank you, Pete Domenici. You will be missed."

— Sandia Labs Director Stephen Younger



SENATORS BINGAMAN AND DOMENICI talk with then-Sandia Director Julia Phillips prior to the dedication of the new Center for Integrated Nano Technologies — CINT — building in 2006.



PETE AND NANCY DOMENICI hug at the gathering to announce the senator's retirement in 2007.

Back to the Canyon

Sandia team continues to quantify fatigue using wearables

This is the second story in a series about the R2R WATCH (Rim-to-Rim Wearables at the Canyon for Health) study, a collaborative project between Sandia and the University of New Mexico (UNM). The interdisciplinary project, led by Glory Emmanuel Aviña from Sandia and Jon Femling from UNM, weaves cognitive science, emergency medicine, systems biology, data science, and sensor technology together to examine early predictors of health events. Lab News reporters Patti Koning and Michael Padilla returned to the Grand Canyon, this time to focus on the results of the R2R WATCH team's partnerships and to see how the team is quantifying performance and fatigue.

By Patti Koning and Michael Padilla

It's 27 degrees at the South Kaibab trailhead, and a set of hikers marvels at the fresh snow visible on the opposite side of the Grand Canyon as the sun peeks just above the horizon. By the time the hikers reach the bottom of the canyon four to six hours later, the snow will be long melted, and the temperature will be at least 30 degrees hotter.

The hikers are ready for the physical trial that lies ahead: 21 miles from rim to rim, including a one-mile change in elevation, extreme swings in temperature, and the mental challenge of the uphill second half. But for the hikers who have volunteered to be in the R2R WATCH study, the first step is to check in at the R2R WATCH tent near the entrance of the south trail. The Sandia and UNM teams collect vital health information from the volunteer hikers, administer cognitive tests, and outfit them with wearable fitness devices. These devices will provide a window into the hikers' physiological changes during their rim-to-rim trek.

This is the second R2R WATCH data-collection study at the Grand Canyon, part of a three-year effort funded by the Defense Threat Reduction Agency (DTRA). The Sandia team is once again collaborating with UNM and the National Park Service (NPS), forming a unified R2R WATCH team that is merging multiple data streams to answer a single question: "What indicators predict the early onset of declines in performance or health?"

Project team members have been at the South Rim since 2 a.m., preparing to greet the first set of hikers, a military group that arrives at 3 a.m. Each study participant is fitted with a wearable device, receives a smartphone for cognitive assessments, has a few teaspoons of blood drawn, and completes a pre-trek survey.

"This study allows us to correlate physiological and cognitive markers to rim-to-rim hike performance," says Cathy Branda, the Sandia project manager. "We can also compare military study participants to civilian volunteer hikers, a comparison of great interest to DTRA."

According to Glory Emmanuel Aviña, Sandia's principal investigator for R2R WATCH, identifying which physi-

ological and cognitive markers are most important for predicting performance and fatigue poses a scientific challenge. To then wrap those markers with their different sensor-technology requirements into a single wearable device will be a future engineering feat.

"One of our long-term objectives is real-time data analytics," Glory says. "Right now we collect data, download data after the hike, and then analyze it. But what if you could analyze the data in real time and identify health concerns before someone had a severe decline in performance? Those predictors could be physiological, like heart rate variability, but they could also be cognitive or genetic."

Strong partnership

Sandia's R2R WATCH study began in 2016 in response to a DTRA call for proposals to evaluate commercial and government off-the-shelf wearable devices. R2R WATCH is an extension of a previous UNM/NPS study — launched in 2015 by Emily Pearce, a former Grand Canyon park ranger — that focused on the nutritional intake of rim-to-rim hikers.

"Everyone brings a unique contribution to the table," says Glory. "UNM has years of experience in emergency response, clinical populations, bloodwork, and nutritional data, enabling us to create a one-of-a-kind, world-class dataset that capitalizes on the UNM infrastructure for collecting physiological data. We are also thankful that the National Park Service allowed our study to take place in the Grand Canyon, which offers both a controlled environment and an ideal setting for studying performance and fatigue since the hikers have to come back up after descending into the canyon depths."

Sandia provides expertise in collecting data from the wearable devices, as well as fusing the multiple data streams such as wearable devices, cognitive tests, biometrics, and blood samples and teasing out meaningful trends. Sandia's advanced capabilities in computational analysis are crucial to solving this part of the problem.

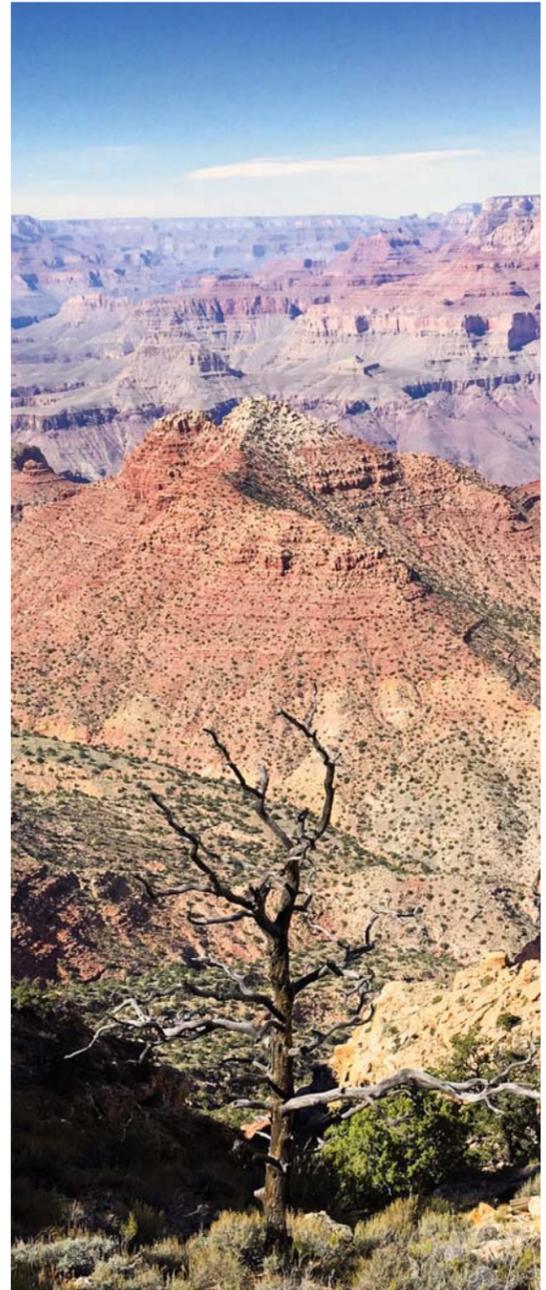
Dr. Jon Femling from UNM says the strength of this partnership goes beyond the considerable expertise of the team.

"Our collaborative study design will allow us to improve Grand Canyon visitor experiences, enhance military capabilities, expand our knowledge of exercise physiology and improve the care of patients," says Femling.

The data generated by military personnel in the study is analyzed to understand performance decline in national security settings.

Ed Argenta, Science & Technology manager for DTRA's Chemical and Biological Technologies Department, says the project will enable DTRA to use real-time data collection and quantitatively show how markers relate to a non-laboratory, mission-relatable performance task. Findings on individual markers also will inform which wearable devices are most useful both in the attributes they measure and the logistics of use.

"The partnership between Sandia and UNM has benefited DTRA tremendously," he says. "The Sandia team



A VIEW from the South Rim of the Grand Canyon.

(Photo by Bill Murphy)

has provided strong connections with military communities of interest and has recruited individuals to participate in the data collection events. The data collected is critical for analysis and algorithm development, which Sandia is managing and performing as well."

Argenta says UNM has provided subject matter expertise on the medical perspective and brought innovative ideas to the project, benefitting the project's data package and subsequent analysis.

"Overall the entire team has been great to work with and our department looks forward to continuing the partnership with Sandia and UNM under this effort," Argenta says. "The goal of developing an early warning to a biological or chemical exposure capability for our warfighters is important. Without great partners it will not come to fruition."

Reaching the North Rim

At the North Kaibab Trail on the North Rim of the Grand Canyon, a pair of hikers appear wearing the red wristbands that identify them as participants in the R2R WATCH study. Victoria Newton, a core member of the study team, congratulates them on finishing the arduous journey.

The hikers flop into camp chairs in front of the R2R WATCH tent and gladly accept some soft drinks. After giving the hikers a few minutes to rest, the researchers spring into action, removing and cataloging the wearable devices. A UNM student administers a survey of questions about their hike. When asked if they'd choose the same hiking companions again, the two hikers laugh and answer affirmatively. They then take the last round of cognitive tests.

Next, the hikers are handed off to other team members who repeat the early-morning data collection tasks first performed at the South Rim. The researchers weigh the hikers and their backpacks, record their pulse and blood oxygen levels, measure their BMI and body fat with a bioelectrical impedance analysis device, and collect blood samples. This data will be used to quantify the hikers' performance and fatigue, as well as associated indicators.

"We were able to collect a lot of useful data, especially because a lot of the volunteer hikers agreed to wear devices, do cognitive tests, and have blood drawn," says Victoria. "The hikers willing to do R2R or R2R2R are incredibly inspiring. It was fun to see the hikers cheering each other on as they reached the top of the Rim and then to how seriously the same hikers took the cognitive tasks. Some got pretty competitive."



CANYON INTERVIEW — Glory Emmanuel Aviña was interviewed by NPR reporter Melissa Sevigny about the study. The story can be found at <http://tinyurl.com/ycodq3fz>.

(Continued on next page)



MEMBERS OF THE R2R WATCH team discuss the activities that took place at the South Rim.

(Continued from previous page)

Quantifying fatigue

Fatigue is defined as extreme tiredness, typically resulting from overexertion — either physical or mental — or illness. We easily recognize our own fatigue when it hits, but the cause and seriousness are often unclear. If you wake up feeling fatigued, does that signal an impending illness, a poor night’s sleep, or excessive stress? Will you shake off that fatigue as the day progresses, or will it continue to wear you down?

“We sometimes sense that we are about to get sick or that external stress is beginning to affect our health,” says Glory. “With this study, we hope to identify predictive signatures for fatigue and quantify the type of fatigue. Is it manageable, meaning your body can recover if you remove the cause, or indicative of a potentially catastrophic health outcome?”

The range in outcomes is clear in the study volunteers after completing the hike. Some are so exhausted they can’t speak when they first approach the R2R WATCH team. Another pair debates hiking back to the South Rim — 21 more miles! They decide to take a shuttle only after realizing that the return hike would stretch into the early hours of the morning—they were worried about being cold, not tired.

Understanding fatigue could have broad impact. “For the military or other physically demanding professions, being able to discern the level and effect of fatigue could be life-changing. For example, when someone is fatigued, can that person keep going or is the fatigue at a level that endangers the individual, mission, or both?” says Cliff Anderson-Bergman, lead project statistician.

Results

Preliminary results have shown a decline in cognitive scores as fatigue sets in. Functional clustering methods also suggest differing effort profiles across subjects, which likely affected fatigue in different ways. Further planned analyses include examining how accurately heart rate variability captures the onset of fatigue and matching different effort profiles to the effects on the metabolic panel data collected before and after the hike.

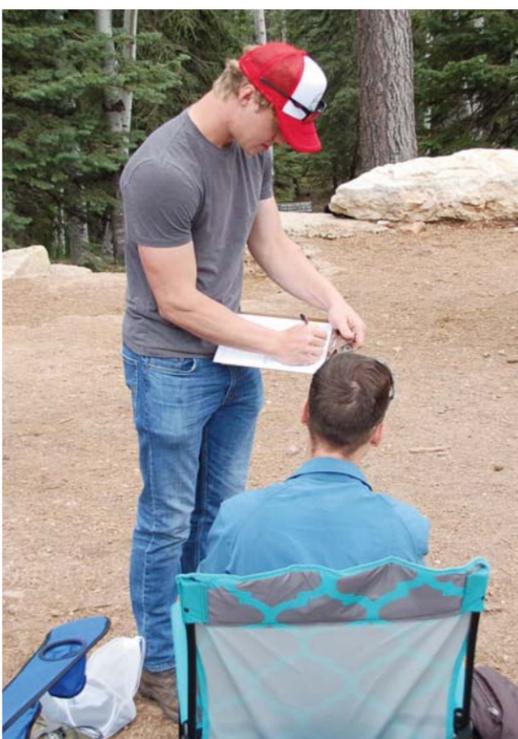


R2R WATCH participants check in bright and early before their 21-mile hike.



Up next

The team will continue to analyze the data and plans on collecting more R2R WATCH data in October. “Like other human-subjects studies, the R2R WATCH study is a balancing act between pursuing science and being considerate of the study participants,” says Glory. “Thousands of hours are spent preparing for data collection. We can’t just throw devices on a person and stick them with a needle. You have to balance caring about a person’s rim-to-rim hiking experience with collecting solid, unbiased data that answers key research questions. That’s a balance that we continue to work toward.”



POST-HIKE DEBRIEF — Information is received from a study participant after the 21-mile rim to rim hike.



TWO HIKERS FOCUS on the cognitive tests as part of the R2R WATCH study.



A R2R WATCH study lead takes vital information from a hiker.



51 individuals, 72 teams

Labs Director's Awards

For the first time, the Employee Recognition Awards include the Sandia Labs Director's Award.

From the 123 winning ERA nominations, each division selected one to be considered for the award. Nominees were considered in the categories of Safety & Security, Quality, Collaboration, Efficiency, Technical Excellence, and Leadership.

"I am pleased to announce that there will be two recipients of the Laboratories Director's Award this year — one for an individual and one for a group," wrote Labs Director Stephen Younger. "Ashley Allen won the individual award for her

leadership in transitioning battery technologies to partnering organizations. Ashley drove this project forward while maintaining a constant focus on safety.

"The group award goes to the Harding team that developed a new platform for inertial confinement fusion and high energy density physics on the Z-machine. This team, which included Matthew Martin, Eric Harding, and Paul Schmit, combined plasma theory, computer simulation, and experiments on Z to create a novel and exciting target concept for pulsed power."

Program honors teams, individuals for exceptional contributions to Sandia

Sandia's Employee Recognition Awards are presented to individual employees and teams nominated by their peers and chosen by a division selection committee with final approval by the division ALD/SD for their accomplishments during the past year.

ERA awards underscore the importance placed on individual and team contributions to Sandia mission success. ERA categories include, for individuals, exceptional service, leadership, technical excellence, safety, and Sandia values, ethics, and integrity. Teamwork awards recognize technical, administrative, and support accomplishments and team safety accomplishments.

Sandia this year recognizes 51 individuals and 72 teams for their outstanding contributions to mission success.



LABS DIRECTOR Steve Younger presents the first-ever Laboratories Director's Awards to Ashley Allen, left, for her leadership in transitioning battery technologies to partnering organizations, and the Harding Team, which developed a new platform for inertial confinement fusion and high energy density physics on the Z-machine. (Photos by Lonnie Anderson)

2017 EMPLOYEE RECOGNITION AWARDS

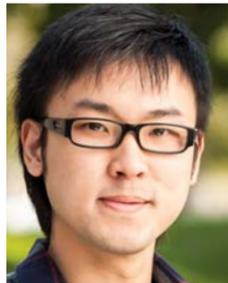
Individual winners



Robert Abbott
Technical Excellence



Ashley Allen
Exceptional Service



Kendrew Au
Exceptional Service



Mark Bruhnke
Exceptional Service



Jose Castillo
Technical Excellence



Anthony Colombo
Technical Excellence



Nathan Crane
Exceptional Service



Sandra Duran
Safety Leader/Change Agent



Richard Elliott
Exceptional Service



Juanita Evans
Exceptional Service



Adam Flynn
Technical Excellence



Christine Ford
Exceptional Service



Jamie Garner
Exceptional Service



Nathan Glenn
Leadership

Team honorees

Division 1

National Security Leadership Development Program (NSLDP) Team

The team successfully executed a redesigned National Security Leadership Development Program, providing critical training for Sandia's future leaders during a time of unprecedented leadership transition.

SF6 Emission Working Group

The Sulfur Hexafluoride (SF6) Emissions Working Group successfully identifies and implements solutions for reducing SF6 emissions from Sandia operations. SF6 is an extraordinarily potent greenhouse gas that is critical to Sandia's mission.

Technical Advisory Group

The Counterintelligence Office strategically teamed with technical SMEs in various

Sandia organizations to understand threats to Sandia's technical programs and emergent R&D technologies. The group's efforts have significantly helped protect national security.

Division 1000

Avondale Intelligent Web Crawler

The Avondale Intelligent Web Crawler efficiently and rapidly analyzes and synthesizes millions of web pages in a couple of days to enhance analysts' decision-making.

First Tritium Shot on Z Team

For careful planning and execution of the first tritium experiment on the Z pulsed power facility.

Harding — a new ICF and HED science platform

For inventing, designing, and demonstrating a novel concept for Magnetized Inertial Fusion and High Energy Density Science experiments on Sandia's Z machine.

REDACT Development and Test Deployment Team

REDACT is a multi-DOE-laboratory effort with the goals of developing new RF sensing capabilities and analytic techniques to advance global security. This year, the team successfully completed a critical field test to prove the capabilities.

W88 ALT 370 Neutron Generator Neutron/Gamma-Ray Development Test Team

The team successfully fired explosively actuated stockpile-candidate neutron generators in the high-radiation environments created by the ACRR operating at peak power, contributing significantly to the qualification of the MC4582 for the W88 ALT 370 system.



Daniel Gonzales
Exceptional Service



James Griego
Exceptional Service



Michael Hagenruber
Leadership



Jane Hillman
Exceptional Service



SF6 EMISSION WORKING GROUP

(Continued on next page)



Sandia honors 2017 award recipients



Leann Jenkins
Exceptional Service



Robert Kaplar
Leadership



Mark Kiefer
Leadership



Lennie Klebanoff
Technical Excellence



Garrett Kliet
Exceptional Service



Charlotte Kramer
Leadership



Timothy Lambert
Leadership



Mark Learn
Technical Excellence



Sarah Leming
Leadership



Lance Lippert
Safety Leader/Change Agent



Maria Logan
Leadership



Jesse Luehring
Exceptional Service



Lori Mann
Exceptional Service



Karli Massey
Leadership



Jessica Mazzie
Leadership



Robert Meagher
Technical Excellence



Keith Meredith
Exceptional Service



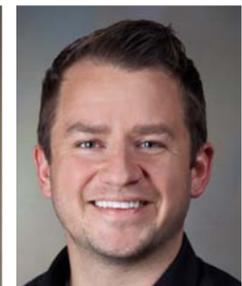
Steve Morrison
Leadership



Malia Orell
Exceptional Service



Jeremy Pacheco
Exceptional Service



Jason Plake
Exceptional Service



Elizabeth Quinley
Exceptional Service



Mohan Sarovar
Leadership



Don Shoemaker
Leadership



John Sirola
Leadership



Jason Sonnek
Leadership



Aaron Thompson
Technical Excellence



Thomas Togami
Exceptional Service

Division 2000

AD/FD Team

This team created and implemented a process to improve the rigor of all NW Electrical Product Definition during the transition from development to production.

B61-12 LEP Phase 6.4 Run-Up Milestones

In recognition of leadership provided for successful execution of B61-12 LEP critical milestones, enabling transition into Phase 6.4 in June 2016: System BDR, delivery of PWDR, PDRAAG and PPEG (gate review and approval).

Hi-Reliability Disassociation Process Improvement

To address security incident concerns, a documented procedure was established to enable realization of 2630-owned products for design, procurement, and delivery to customer when disassociation of the product and customer use is required.

Integrated Stockpile Evaluation Systems Planning Team

This team's effort resulted in Integrated Stockpile Evaluation Plans for each stockpile system and a Consolidated Stockpile Evaluation Plan that identifies cross-system focus areas. This work lays the foundation for our risk-informed stockpile evaluation approach.

Launch Accelerometer Design Guide

For exceptional teamwork and technical excellence in creating a comprehensive guide to launch accelerometers including a historical perspective, requirements, analysis, materials selection, design best-practices, and ongoing research challenges being addressed by the design teams.

Mk21 AFA Thermal Qualification Team

The team completed a series of testing, analysis, and computational simulations providing significant evidence for the AFA BDR. Contributions included thermal performance and thermal cycling data, abnormal thermal environments response, and a validated thermal model.

N-Ray Image Analysis Team

The N-Ray Image Analysis Team developed and implemented a process for computationally analyzing n-ray images that enabled informed and timely decisions to be made regarding a critical component production problem.

RTG Subcomponent Team

This RTG sub-component team balanced accelerated S&T with manufacturing considerations to overcome a late, sub-component design flaw before proceeding with a baseline design that is meeting or exceeding all requirements.

Switchtube Product Realization

The Switchtube Product Realization Team enabled the 2A8184-00, MC4971 Poco Sprytron to be the first component to reach full Diamond Stamp Product Acceptance for the W88 ALT-370 Firing Set.



Nairong Wang
Technical Excellence



Glen Watts
Leadership



Jason Wertz
Exceptional Service



Tommy Williams
Leadership



Steven Wolfley
Exceptional Service

Thermal Battery Test System Design Team

The Thermal Battery Test System Design Team has supported Thermal Battery Test activities while continuing to deliver on new system design and development to meet new testing requirements.

Tonopah Test Range Mission Team

TTR accomplished major systems, facility, infrastructure, and operational safety enhancement upgrades in the award period enabling the B61-12 and stockpile programs to remain on timeline with 100 percent mission success.

W88 ALT 370 Blast Tube Test Team

In recognition of the teamwork accomplished for the successful planning and execution of a large scale, complex, blast tube test the first for the W88 ALT 370 program.

W88 ALT370 Firing Subsystem Product Realization Team

Sandia's W88 ALT370 Firing Subsystems Product Realization Team delivered technical excellence in all facets of designing, developing, and maturing

the firing set to meet and exceed customer requirements.

Division 3000

M&O Contract Transition Communications Team

A communications team prepared Sandia's communications products for the new operator and planned an all-hands meeting and news conference to introduce the new leaders to employees, the community, and stakeholders on their first day.

Virtual Tours Team

Using dynamic panoramic photos, vibrant videos, and captivating dialogue, the Virtual Tours tool offers new-hires, potential employees, long-time employees, and cyber visitors a glimpse of Sandia facilities and advanced technologies.

Division 4000

858N 72" Acid Exhaust Wye Replacement Team

For performing tirelessly with excellent planning and execution to install a 72" Stainless Steel 'Wye' fitting on the roof of 858N over the 2016 Christmas Shutdown, which ensured no major impacts to ASIC production.

Custodial Services Work Safety Team

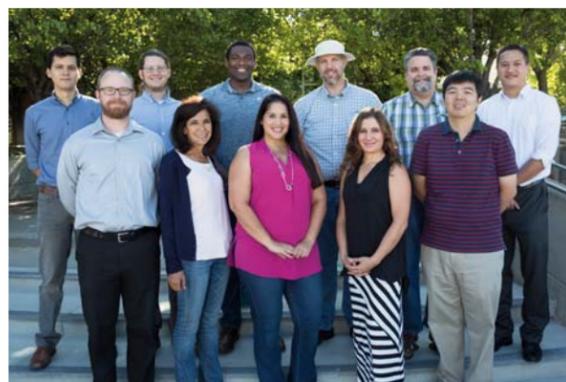
For performing work without a recordable injury for more than 550 days. Deferred Maintenance Special Emphasis Program (DMSEP) Team

In support of a federal directive for real property asset management and Sandia Strategic Objective 2, this team committed to successfully reducing Sandia's deferred maintenance by \$26 million, with a budget of \$37 million. Facilities Deep Dive Team

The Facilities Deep Dive Team compiled corporate and DOE facilities data with mission effectiveness and efficiency information to meet the NA-50 Deep Dive initiative that they described as setting a very high bar.

Personnel Security Team

The Personnel Security Team, to include the Clearance Office, Badge Office,



W88 ALT370 FIRING SUBSYSTEM PRODUCT REALIZATION TEAM

(Continued on next page)



PERSONNEL SECURITY TEAM

(Continued from preceding page)

Contract Security Management, Validations Office, and Foreign Interactions Office, provided outstanding support for the timely and successful transition of Sandia National Laboratories to NTESS.

Quality New Mexico Roadrunner Award

The Drive Operational Excellence Team took on the challenge of submitting an application for the Quality New Mexico Roadrunner Recognition Award. The Team was successful and was presented with the Roadrunner Award in April.

VTR Enhancement Project Team

Successfully developed/installed a site-wide VTR enhancement providing a better integrated/engineered design that resulted in reducing the security complexity for the Mission users to a three-step process to secure/unsecure the VTR.

Division 5000

CMOS8 Device, Design, and Rad-Hard FPGA team

For exceptional technical teamwork in rapidly developing and demonstrating the CMOS8 process and test chip, and developing the radiation hardened FPGA IP and layouts, including the complex licensing agreement with a commercial FPGA partner.



CMOS8 DEVICE, DESIGN, AND RAD-HARD FPGA TEAM

Electronic Production Control System (EPCS) MESA NW ASIC/HBT team

For developing and supporting an Electronic Production Control System that tracked ASICs and HBTs; processed ~100 GB of data per lot; implemented over 221 process improvements and reduced acceptance inspection time by 80 percent.

FIE Configuration Management Board Methodology

In recognition of developing an outstanding methodology for the configuration management of classified networks in the Field Intelligence Element (FIE) computing environment.

ITUS (Intelligent Transceiver for Universal Signalling) Team

The Sandia Intelligent Transceiver for Universal Signaling team was identified as the most sophisticated counter Unmanned Aerial System (cUAS) detection, localization, and negation system at one of the military's largest joint service/COCOM cUAS exercises

Navy Flight Experiment 1 Software Development Team

In recognition of the teamwork, the magnitude of the collective effort, the dedication, and the sacrifice required to realize the real time flight control software for the Navy Flight Experiment 1 Program.

NW Joint Radar Laminate MCM Substrate Team

Maturing laminate substrate technology (design, materials & producibility) in 18 months for the Joint Radar Module multi-chip modules for 3 weapons programs; reducing LEP execution risk and achieving significant cost savings.

Triboelectric Charging Yield Improvement Team

For identifying the cause (triboelectric charging in a wafer washing tool) of reduced yields in all NW ASIC product and CVV wafers. More than 50 Sandia tools were characterized and deemed safe from this failure mode.

VEDAR

The VEDAR team developed, demonstrated, and educated about their unique tools to secure Critical Infrastructure. The VEDAR tools detect anomalies and visualize internal CI network behaviors that were previously invisible, supporting DHS-ICS-CERT's vital technical mission.

VENOM Spider Bite

Venom crew exemplifies the highest qualities of a Sandia technical team with respect to innovation, partnering, and delivery of a superior product in a demanding, evolving requirements domain to the resounding satisfaction of their sponsor.



VENOM SPIDER BITE



Division 6000

Counter Unmanned Aerial Systems Testing & Evaluation Team

Supporting NNSA's CUAS T&E Program in pursuit of identifying viable systems, while addressing technology gaps with innovative R&D solutions that meet the desired performance requirements for deployment and security at the nine NNSA sites.

Division 6000 Operational Risk Management

The Operational Risk Management team has eliminated risk or mitigated risk to acceptable levels through an integrated risk approach and fostering critical thinking throughout all aspects of Activity Level Work.

GBD III Prime Intra-Lab System Preliminary Design Review Team

For exceptional teamwork to successfully complete the Intra-lab GBD III Prime System Preliminary Design Review.

Payload Test and Characterization Team

For exceptionally skilled technical engagement and critical support of complex satellite payload testing and characterization activities.

Red Tide

The Red Tide team completed a cybersecurity test and evaluation of the Office of Naval Research's Tactical Cloud Reference Implementation deployed in the CANES system onboard US Navy vessels, on schedule and under budget.

T3 Explosives Testing

For excellence in safe operational execution of a critical National Security explosives experiment which changed community-wide understanding of a specific explosives phenomenon.

Ten Year Refresh Plan for NNSA Nuclear Facilities

The Ten Year Refresh Plan analyzed the existing infrastructure and physical security systems across the NNSA nuclear weapons complex, then developed a prioritized list of security projects to refresh those systems.

TREND Team

For successful on-time and under-budget delivery of TREND hardware that met all requirements for use in a unique, high-visibility, high impact field situation - as the radiation detection equipment for the New START treaty.

Division 8000

Advanced Mathematics

The Advanced Mathematics team provided a creative advanced mathematical software solution to an urgently needed NW-based problem.

Awesome PV Business Support Team

The team was instrumental in transforming Sandia's PV Systems Laboratory physically and operationally, enabling the success of >\$8 million in research activities. The team significantly improved infrastructure, project management, and milestone, inventory, and financial tracking.

B61-12 FASTER 2.0 Data Recorder Team

The Functional AMAC System Tester (FASTER) 2.0 Data Recorder has been a crucial component of the B61-12 qualification activities specifically with respect to the weapon-to-plane and weapon-to-TailKit Assembly communication interfaces.



B61-12 FASTER 2.0 DATA RECORDER TEAM

Capabilities Systems Engineering

For concurrently executing multiple parallel full-scale engineering development efforts including two successful rounds of environmental testing, three design reviews exceeding customer expectations, and developing a mod/sim capability to analyze fielded product demand.

Dept. of Homeland Security Chemical Facility Anti-terrorism Standards Support Team

For three years, Sandia made significant contributions as an independent technical advisor and reviewer for the Chemical Facility Anti-Terrorism Standards Program enabling DHS's success in risk reduction and communication with industry, GAO, and Congress.

National Security High-Flux Concentrating Solar Testing Team

For planning, designing, constructing, troubleshooting, and successfully performing a multitude of high-flux, high-temperature tests for the Department of Defense to improve operational and mission safety for our armed forces and first responders.

NextGen

The NextGen team has rapidly developed its technology to the point where it is now considered the baseline option for the Joint Technology Demonstrator and is exceeding expectations on our Level 2 Milestones for NNSA.

Power Grid Oscillation Damping Control Design Team

Unstable power oscillations can jeopardize grid reliability and cause widespread blackouts. The team built the first controller to damp these oscillations using real-time measurements to modulate existing DC lines. This improves grid security and economic benefits.



SANDIA/CALIFORNIA 60TH ANNIVERSARY PLANNING TEAM

Sandia/California 60th Anniversary Planning Team

The Sandia/California team worked vigorously in planning, promoting, and executing the site's 60th anniversary by showcasing the Lab at an event in downtown Livermore. The team focused on 60 years of engineering, science, and service.

Sandia W80-1 ALT369 Product Realization Team

Successful W80-1 major alteration production readiness efforts through enterprise partnership and excellence in integrated technical and programmatic execution.

Sandia/California Site Sustainability Plan Team

For successfully completing and submitting the FY 2017 Site Sustainability Plan

VPE CRADA Team

The VPE CRADA Team received a national 2017 Award for Excellence in Technology Transfer by the Federal Laboratory Consortium for ongoing work to advance heat exchanger technology with CRADA partner Vacuum Process Engineering.

Division 9000

CAP/QAIP Development Team

For development of a new process decreasing product acceptance time while increasing confidence in product quality.



CAP/QAIP DEVELOPMENT TEAM

Center 9200 Team Supporting IG Issues Management Audit

For collaborating across Sandia and with SFO and auditors to ensure that a thorough and transparent OIG Audit of Issues Management was completed in just eight months.

PRIME Project Team

Exceptional technical team delivering a high impact application using an extensible service-based architecture that transforms NW business processes and IT efficiencies, meeting a Sandia Level-II milestone commitment to NNSA.

Pro-X

The Pro-X team leveraged Sandia talent and computing resources to overcome aggressive time constraints to demonstrate critical web-based visualization capabilities in a classified cloud environment to meet an important SIPP customer milestone.

Weapon Response Analyst Training Development Team

For implementing a successful pilot of the first phase of the Weapon Response Analyst Training and Qualification Program, aimed at building Weapon Response Analyst competences to improve the safety of nuclear explosive operations.

Division 10000 Winners

Enterprise Business Intelligence Development Team

The EBI (Enterprise Business Intelligence) Portal combines both human resource (HR Queries) and financial (Reportville) reports into one reporting environment. This tool is designed to help users find reports more efficiently using modern technology.

Enterprise Geographic Information System Development - Facilities and Asset Management Systems

New Sandia Maps application gives New Mexico, California, and Nevada sites the ability to search for a building, room, person, or gate.

Expense Report Plus - Travel Vision Team

The ERPlus team transformed the work experience for >1,000 managers and >7,800 travelers by automating per-diem reimbursements, implementing auto-approval of specific travel reports, improving paperless receipts with drag and drop, and integrating conference approvals.

Procurement Guideline Reengineering

For exceptional teamwork in reengineering Procurement's Policy System

Reapplication Team

The Reapplication Team dramatically and significantly improved the quality of operations and customer service, increased cost avoidance, dramatically reduced turnaround times, and greatly improved the safety environment of the facility.

Simplified Remote Access on iPhones and iPads

For the design, development, and implementation of a mobile device authentication solution that eliminates the need of a cryptocard when mobile users connect remotely to Sandia's network resources such as TechWeb, TimeSheet, and Expense Report.

SPP Automated Closeout (SAC) Tool

The team created an automated, user friendly tool that reduces errors, eliminates redundancy, and simplifies the closeout process.

Division 11000 Winners

Prime Contract Transition Team

The Prime Contract Group served as the primary interface between NTESS, SFO, Honeywell, Lockheed Martin, and Sandia during the contract transition, successfully balancing all stakeholder interests.

SANDIA CLASSIFIED ADS

How to submit classified ads

DEADLINE: Friday noon before week of publication unless changed by holiday.

Submit by one of these methods:

- EMAIL: Michelle Fleming (classads@sandia.gov)
- FAX: 844-0645
- MAIL: MS 1468 (Dept. 3651)
- INTERNAL WEB: From Techweb search for 'NewsCenter', at the bottom of that page choose to submit an ad under, 'Submit an article'. If you have questions, call Michelle at 844-4902. Because of space constraints, ads will be printed on a first-come basis.

Ad rules

1. Limit 18 words, including last name and home phone (If you include a web or e-mail address, it will count as two or three words, depending on length of the address.)
2. Include organization and full name with the ad submission.
3. Submit ad in writing. No phone-ins.
4. Type or print ad legibly; use accepted abbreviations.
5. One ad per issue.
6. We will not run the same ad more than twice.
7. No "for rent" ads except for employees on temporary assignment.
8. No commercial ads.
9. For active Sandia members of the workforce, retired Sandians, and DOE employees.
10. Housing listed for sale is available without regard to race, creed, color, or national origin.
11. Work Wanted ads limited to student-aged children of employees.
12. We reserve the right not to publish any ad that may be considered offensive or in bad taste.

MISCELLANEOUS

- DINING ROOM SET, w/china hutch, mission-style, oak, w/8 chairs, 2 leaves, extends to seat 10, excellent condition, \$1,750. Legan, 505-239-1027.
- SINGLE DAYBED, w/mattress, black metal frame, good child's bed, great condition, \$100. Hatch, 505-507-7133.
- AMAZON KINDLE, 8th-gen., 4GB, USB charging cable, plus USB power adapter, used once, \$65. Kaplan, 505-270-7425.
- LOFT BED, twin, needs mattress, \$20. Lauben, 505-980-2915.
- PORTABLE CRIB, Pack and Play, gently used, great shape, w/moisture pads & sheets; Bowflex Sport, w/book of exercises & accessories. Maestas, 505-550-0163.
- COMPUTER HUTCH, solid oak, 22"D x 6"H x 40"W, keyboard pullout, file drawer storage, excellent condition, photos available, \$400. Willmas, 505-281-9124.

- JITTERBUG FLIP PHONE, barely used, w/car charger, \$75. Ghanbari, 505-400-4188.
- FORMING DINING TABLE, w/6 chairs, regency-style, oval, mahogany, brass inlay on chairs, \$700 OBO. Ashford, 505-286-2528.
- BOOKCASES, 2, 6' x 3', w/matching 2-drawer executive file cabinets (2), solid oak, good condition, \$150. Wells, 292-0179.
- SONY RECEIVER, JVC cassette player, \$100/both. Drebing, 293-3335.
- PURSE, Dooney & Bourke, tan, medium-size, equestrian cross, excellent condition, \$45. de la Fe, 505-459-4685.
- REESE PRO SERIES, friction sway control bars & trailer hitch, photos available, \$235 OBO. McAllaster, 270-8930.
- MOVING BOXES, ~70 large, medium, small, free. Mangum, 505-238-8383.
- BABY PRODUCTS: Chicco car seat w/base, \$100; Babytrend double Snap-n-Go universal stroller, \$50; bath center, \$20. Herrera, 505-554-5639.
- BENCH GRINDER, 6-in., \$125 OBO; 5-gal. gas can, \$9; folding lounge chairs, 2, \$45 ea. or \$80 both; bicycle safety helmets, 2, \$10 & \$12, never used. Garcia, 554-2690.
- GENERATOR, Coleman Powermate, 5000-W, 10-hp, Tecumseh engine, \$200. Pechewlys, 505-856-6878.

TRANSPORTATION

- '11 NISSAN MAXIMA S, white, beautiful inside & out, 93K miles, \$10,000 OBO. Widerkehr, 505-507-0774.
- DODGE RAM 1500, 4x4, quad cab, Laramie, V8 Hemi, Leer top, newer tires, 130K miles, \$11,000. Amador, 505-259-8919.
- '03 FORD FOCUS ZX3, manual, clutch replaced in '15, CD player, AC, 147K miles, \$1,800. Jackson, 688-5175.
- '98 FORD F150, no accidents, 1 owner, new headlights, brakes struts & shock, 161K miles, excellent, \$4,500. Montoya, 342-0043.
- '57 CHEVY BEL AIR, 4-dr., project car, call or text for info, photos, \$5,000. Hanks, 505-249-1931.
- '17 JEEP GRAND CHEROKEE, 4x4, many options, 8.4-in. touch screen, burgundy, 12K miles, like new condition, \$32,000. Pacheco, 505-321-2492.
- '15 FORD EDGE TITANIUM, AWD, silver, black leather, all the features, ~28K miles, great condition, \$28,000. Atkins, 505-259-3634.
- '08 HONDA CRV, AWD, new stereo, alloy wheels, receiver hitch, 1 owner, 173K miles, great condition, \$6,900. Tullai, 505-363-3026.

RECREATION

- '99 KAWASAKI VULCAN NOMAD 1500, w/Champion Legend sidecar, <14K miles, winaims.com/images/mc.jpg, \$8,000 OBO. Humbert-Hale, 505-480-6824, text/voice-mail.
- '96 GLASTRON GS205, ~260 hrs., new upholstery, 5 new trailer tires, fish finder, skis, vests, tow ropes, \$6,500. Hudson, 980-3802.
- '12 HARLEY-DAVIDSON 1200 CUSTOM SPORTSTER, many options, 19K miles, super clean, free HD helmet, \$7,750. Atencio, 249-8395.
- TANDEM BICYCLE, Motobecane, 15-spd., drum brake, seat posts lengths 56 cm and 52 cm (rear), \$500. Dykhuizen, 281-6892.
- '14 NOVARO BIG BUZZ BIKE, medium, commuted 10 miles round trip for 2 yrs., great condition, \$300. Kubal, 505-228-2669.

REAL ESTATE

- 4.25 ACRES, currently categorizes as agricultural, Jarales NM. Parker, 505-453-7405, ask for Lorraine.
- 3-BDR. CUSTOM HOME, 2 baths, 3-car garage, 2153-sq. ft., Rio Rancho, gorgeous view of the Sandias, \$299,000. Buck, 353-2667.
- 3-BDR. HOME, 2-1/4 baths, deep garage, quiet Tramway/Cooper neighborhood, new appliances, Mastercool, etc., MLS#901187, \$166,500. Carter, 505-681-6312.
- NOB HILL CONDO, modern, gated, natural lighting, covered parking, walking distance to shops, restaurants, \$79,000 OBO. Moreno, 294-4268.
- 3-BDR. HOME, 2 baths, 1,900-sq. ft., solid & updated, tile floors throughout, new countertops, new bathrooms, 1 block from La Cueva High. Frances, 505-553-2431, ask for Linda.
- 3-BDR. HOME, 2 baths, 1,760-sq. ft., lots of updates, large backyard, Hoffmantown area, MLS#896559, \$199,900. Crawford, 505-263-0376.

WANTED

- GAZELLE EXERCISE EQUIPMENT. Baca, 505-385-0137.
- BOOKS ON ROAD ENGINEERING, with special interest on roads in mountainous environments. Menicucci, 235-8501.



New Mexico Campaign: **Oct. 2-20**
California Campaign: **Oct. 2-27**

BOOK FAIR

OCTOBER 3-5
Steve Schiff Auditorium Lobby
10:00 am-3:00 pm

OCTOBER 10-12
Thunderbird Cafeteria
10:00 am-3:00 pm

OCTOBER 17-19
IPOC 2nd Floor Break Room
10:00 am-3:00 pm

give.sandia.gov

Shop in the convenience of your workplace. Save on a big selection of books and gifts.

A percentage of the proceeds supports your local Community Fund.



UNITED WAY OF CENTRAL NEW MEXICO

ONE DOLLAR A WEEK
\$52.00/YEAR
\$2.00 per pay period

- Shoes and pants to prepare someone for work (Catholic Charities)
- One hour of PTSD counseling for a victim of trafficking (Formation)
- A calculator and SAT test prep book for a college-bound student in need (Working Classroom)

Mileposts



New Mexico photos by Michelle Fleming
California photos by Randy Wong



Ed Cole 30



Linda Wagner Barnett 25



Jeanette Orona 25



Pin Yang 25



Charles Eberle 15



Benjamin Garnas 15



Eugene Ormond 15



Lisa Teraji 15



George Wang 15



'Muy especialmente'

Sandia marks Hispanic Heritage Month



More than 200 Sandia staff and visitors celebrated Hispanic Heritage month last week with speeches, good food, delicious paletas, music, and dancing. Events were organized by HOLA — Hispanic Outreach for Leadership and Awareness — and sponsored by DOE/NNSA, Kirtland Air Force Base, and the Sandia Zero Waste program. HOLA leaders Rita Garcia and Keith Vigil and a cadre of volunteers labored for months to stage the event, which included a student art contest, a Diversity Cinema showing of *The Latino List* and entertainment at Hardin Field.

Month officially established in 1968

Labs Chief of Staff Pablo Garcia handled emcee duties, telling the crowd that Sandia sees the month-long celebration as *muy especialmente*. He added that President Lyndon Johnson began the tradition in 1968 to “recognize the contributions of Hispanic and Latino-Americans to the country’s heritage and culture.” Pablo thanked HOLA volunteers Catalina Acosta, Erin Akinnikawe, Emily Baca, Veronica Barraza, Miquelita Carrion, Dorean Chaleunphonh, Daniel Cordova, Theresa Cordova, Liz Gallegos, Joshua Herrera, Riley Jordan, Guadalupe Massoth, Juan Molinar, Lyndsy Ortiz, Stefanie Portillos, Roberta Rivera, Daniel Sandoval, Lisa Sena-Carian, and others.

Associate Labs Director of Mission Services Scott Aeilts told attendees that he’s honored to serve as executive champion for HOLA. In nearly three decades of service to the Labs, he said, the organization has helped place qualified Hispanics in Sandia jobs, promoted awareness of career opportunities for local Hispanic youth, and fostered mentorship opportunities.

Other VIP speakers included NNSA Sandia Field Office Manager Jeff Harrell and USAF Col. Michael Harner, 377th Mission Support Group commander at Kirtland.

Finally, Bernalillo County Commissioner Steven Michael Quezada, one of the stars of TV’s *Breaking Bad* series, gave a funny, piquant keynote address about growing up in Albuquerque, his Chicano identity, and his work to reduce gang violence through Youth Development Inc.

The crowd then enjoyed musical stylings and the high (alternative) energy of The Solarez Band, Sandia staff members from the National Solar Thermal Test Facility.



SAMBA SIZZLE — Dance workout participants follow the moves taught them by instructor Lisa Jaramillo (left). (Photo by Norm Johnson)



THE SOLAREZ BAND — Sandia solar energy staff members, left to right, Roy Lopez, Kenny Armijo, and Jesus Ortega entertain the crowd. (Photo by Norm Johnson)



DELICIOSO tacos, paletas, and other treats served up from food trucks kept attendees at the Hispanic Heritage Month event well-nourished. (Photo by Norm Johnson)



LOS BAILADORES DE ORO Education Dancers dazzled the crowd with their intricate moves. (Photo by Liz Gallegos)



ATTENDEES at the celebration relaxed and socialized with great food and grand entertainment. (Photo by Liz Gallegos)



MASTERFUL EMCEE — Sandia Chief of Staff Pablo Garcia called Hispanic Heritage Month *muy especialmente*. (Photo by Norm Johnson)



SPEAKERS at the event led the Pledge of Allegiance: Pablo Garcia, Sandia chief of staff; USAF Col. Michael Harner, 377th Mission Support Group commander at KAFB; Bernalillo County Commission vice chair Steven Michael Quezada; and Jeff Harrell, manager of the DOE/NNSA Sandia Field Office. (Photo by Liz Gallegos)



BREAKING BAD star and Bernalillo County Commission vice chair Steven Michael Quezada, the day’s keynote speaker, talks about Sandia with Labs Director Stephen Younger. (Photo by Norm Johnson)



HOLA VOLUNTEERS from across the Labs spent months planning and organizing the celebration at KAFB’s Hardin Field. Pictured here are, top row, left to right, Catalina Acosta, Liz Gallegos, Juan Molinar, Lyndsy Ortiz, Daniel Sandoval, Joshua Herrera, Erin Akinnikawe, and Emily Baca; and in the front row, Dorean Chaleunphonh, Lisa Sena-Carian, and Roberta Rivera. (Photo by Norm Johnson)



DECORATING Hardin Field for the event are HOLA volunteers Emily Baca and Catalina Acosta. (Photo by Norm Johnson)