

THE BELOVED TUMBLEWEED SNOWMAN, placed on I-40 each year by employees of the Albuquerque Metropolitan Arroyo Flood Control Authority, greets holiday travelers and city residents alike. *Lab News* photographer Randy Montoya captured this image just after dusk

on a recent wintry evening from a safe location and with special permission granted by AMAFCA. The snowman, placed in the same location every year since 1995, stands almost 15 feet tall and is built using 10 or so giant tumbleweeds. (Photo by Randy Montoya)

NNSA Defense Programs  
**AWARDS of EXCELLENCE**

See pages 8-10

Exceptional service in the national interest

Sandia **LabNews**

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# Safe, secure, sustainable labs

By Mollie Rappe

**A**n outbreak is like a wildfire; the sooner it's caught, the easier it is to fight, says Vips Halkjaer-Knudsen, a project lead and lab design expert in Risk Management Dept. 6824.

To detect an outbreak early — whether Ebola, Zika, or influenza — healthcare workers must have a local, trustworthy diagnostic lab. For the past five years Sandia's International Biological and Chemical Threat Reduction group has served as a trusted adviser for design of diagnostic labs around the world that are safe, secure, sustainable, specific, and flexible.

Now, Bill Arndt (6824) has developed a new method to speed up the critical initial stages of the lab design process used by Sandia, without sacrificing results. Bill and his team used his Prototype Lab tool in Iraq to support the initial design of the central veterinary lab.

"We have all these laboratory and support space modules and the idea is like going back to when you were a kid with LEGO bricks. We work with the in-country partners to actually put the pieces together to build a functional lab," says Bill.

The Prototype Lab tool, funded by the Defense Threat Reduction Agency's Cooperative Biological Engage-

(Continued on page 3)

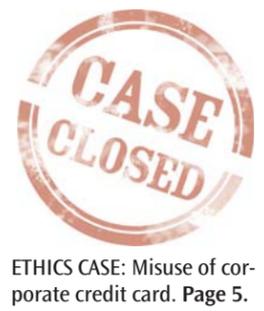
Baby, it's cold outside . . . and slippery

| ABOVE FREEZING  | TRANSITION  | FREEZING  |
|---|---|---|
|  |  |  |
| Temperature 36° or above  | Temperature 34° or above  | Temperature 32° or below  |

LOOK FOR THESE SIGNS at strategic locations around the Labs to warn you as freezing conditions develop.



LATEST on Sandia Science & Technology Park. Page 4.



ETHICS CASE: Misuse of corporate credit card. Page 5.



OPERATIONAL Innovation Celebration. Page 11.



AND THEY'RE OFF! Electric Car Challenge. Page 12.

## A grand challenge

Arizona landmark is laboratory for Sandia's R2R WATCH program

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## That's that

Just about the time The Beatles were singing *Hello, Goodbye* the space team at MIT's Lincoln Lab was experiencing a real-world version of the song's title. And not in a good way.

The lab's LES1 satellite, launched in 1965 as part of a US Air Force-sponsored program to test techniques for satellite communications, worked swimmingly for a while – Hello! – and then something went very wrong.

Ground controllers lost contact with the satellite in 1967 and after heroic efforts to reestablish a comms link, program managers came to the very reasonable conclusion that the LES1 was gone. Goodbye!

Imagine the surprise when, a couple of years ago, amateur radio satellite enthusiast Phil Williams from Great Britain detected signals from an unknown source that he suspected might be the long-lost bird. After detailed analysis of the signal's signature and the orbital parameters, it was just recently confirmed authoritatively to be LES1.

The LES1 signal is intermittent, apparently only broadcasting when its solar panels are in direct sunlight; its rechargeable batteries are believed to have quit working decades ago. It's not clear to scientists and engineers just why the satellite "decided" to come back online after a five-decades-long hiatus, but I think there's a perfectly good explanation. It's called "the perversity of inanimate objects," a well-known phenomenon we've all experienced in our own lives. Simply put, it might be defined this way:

*Any inanimate object may be expected at any time to behave in a manner that is entirely unexpected and totally unpredictable for reasons which are completely unknown or thoroughly obscure.*

Surely you've experienced it. After years of faithful service, your car refuses to start the morning you absolutely, positively have to get to the airport by 6:30 a.m. Your oven, practically brand new, decides to quit working the day before you're planning to cook that big Thanksgiving turkey. Your perfectly reliable septic system goes down the weekend your in-laws will be staying with you.

Most of the time, as the examples above suggest, the perversity of inanimate objects seems willfully directed against us poor pitiful humans. But now and then, it goes the other way, too. Sometimes, when the stars are aligned and we've built up a stock of good karma, inanimate objects will delight us in surprising and unpredictable ways.

LES1 is a case in point. And I have my own recent mini-example. A couple of years ago, I got one of those semi-pro weather stations with all kinds of bells and whistles. It worked great for the longest time and it was fun to be able to track and chart things like the highest wind gust of the month or total rainfall for the year. Suddenly, a few months ago, the perversity factor kicked in and the darned thing went offline. Wasn't the batteries, wasn't the wireless connection. There was no good explanation; to borrow a phrase from Mercury astronaut Gus Grissom, "It just blew."

Luckily, even though I thought the station was done for, I hadn't gotten around to taking it down off my roof when – what do you know? – weeks after its failure it started streaming data to my desktop monitor again. Just like that. I have no more idea of why it came back online than I do as to why it went down in the first place. But I'm not complaining. If you grouse about your machines or call them names, they have ways of getting back at you. They really do.

\* \* \*

With the annual holiday season fully upon us, I thought I'd pass along a cautionary tale that my colleague Jim Danneskiold shared with me. While perusing through Leland Johnson's engaging and fascinating book, *Sandia National Laboratories, a History of Exceptional Service in the National Interest*, Jim came across this nugget:

*Although Sandians have for the most part been law-abiding and of exemplary behavior, there was a famous altercation in 1958 at the Coronado Club at an event called the Beachcombers Ball. A few male Sandians went swimming while inebriated, and the Club management decided to take action. When some members refused to leave the pool, the manager summoned the MPs. Those members at poolside were incensed and resisted the MPs, throwing one in the pool. Several celebrants were arrested and given light fines for drunkenness. A massive investigation by the Provost Marshall and the Club Board of Directors followed, which ended up with the New Mexico Congressional delegation and the AEC. Needless to say, that was the last Beachcombers Ball.*

The moral of the story: If you go to any Christmas parties this year, whatever you do, don't throw the MPs in the pool!

See you next year.

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

## Recent Patents

Note: Patents listed here include the names of active and retired Sandians only; former Sandians and non-Sandia inventors are not included. Following the listing for each patent is a patent number, which is searchable at the US Patent and Trademark Office website ([www.uspto.gov](http://www.uspto.gov)).

\* \* \*

Steven E. Allen (429) and Paul G. Clem (1353): Reduction of Radar Cross-Section of a Wind Turbine. Patent No. 9,404,371.

Michael Wanke (1118): Monolithically Integrated Absolute Frequency Comb Laser System. Patent No. 9,391,420.

Michail A. Gallis (1513), John R. Torczynski (1513), and Anthony S. Geller (1516): Methods and Apparatus for Use with Extreme Ultraviolet Light Having Contamination Protection. Patent No. 9,389,180.

Paul C. Galambos (1719), Thomas B. Crenshaw (1851), Jeffrey W. Lantz (2159), Erik E. Nishida (5421), and Damon J. Burnett (5947): Silicon Force Sensor. Patent No. 9,383,270.

Paul J. Resnick (1719) and Alex L. Robinson (2632): Miniaturized Photoacoustic Spectrometer. Patent No. 9,410,931.

Paul J. Resnick (1719) and Kristin L. Hertz (8127): Integrated Field Emission Array for Ion Desorption. Patent No. 9,425,019.

Paul Davids (1765) and Christopher DeRose (1765): Two-Dimensional APDs and SPADs and Related Methods. Patent No. 9,391,225.

Paul Davids (1765) and David W. Peters (1765): Rectenna That Converts Infrared Radiation to Electrical Energy. Patent No. 9,437,629.

David Bruce Burckel (1765) and Gregory A. Ten Eyck (2241): Fabrication Method for Small-Scale Structures with Non-Planar Features. Patent No. 9,448,336.

Christopher A. Applett (2546): Microfluidic Pressure Amplifier Circuits and Electrostatic Gates for Pneumatic Microsystems. Patent No. 9,447,895.

Juan M. Elizondo-Decanini (2624): Short Pulse Neutron Generator. Patent No. 9,408,286.

Alex L. Robinson (2632): Miniaturized Photoacoustic Spectrometer. Patent No. 9,410,931.

Farrell Lynn Ostler (5323): Method, Apparatus, and System for Managing Queue Operations of a Test Bench Environment. Patent No. 9,396,081.

Richard M. Naething (5344): Subaperture Clutter Filter with CFAR Signal Detection. Patent No. 9,429,644.

Hung Loui (5345): Reduction of Radar Cross-Section of a Wind Turbine. Patent No. 9,404,371.

Erik E. Nishida (5421) and Damon J. Burnett (5947): Silicon Force Sensor. Patent No. 9,383,270.

David R. Wheeler (5964): Method to Fabricate Functionalized Conical Nanopores. Patent No. 9,387,444.

Mark J. Rigali (6224), Mark D. Tucker (6633), Patrick V. Brady (6910), and Robert C. Moore (6915): Apatite Sequestration of Selenium. Patent No. 9,440,217.

Mark J. Rigali (6224), Mark D. Tucker (6633), and Robert C. Moore (6915): Apatite Sequestration of Technetium. Patent No. 9,443,627.

David W. Raymond (6916): Fluid Powered Linear Piston Motor with Harmonic Coupling. Patent No. 9,447,798.

David W. Raymond (6916): Self-Assembling Segmented Coiled Tubing. Patent No. 9,453,376.

Kristin L. Hertz (8127): Integrated Field Emission Array for Ion Desorption. Patent No. 9,425,019.

Mark D. Allendorf (8300), Vitalie Stavila (8341), Francois Leonard (8342), and Albert Alec Talin (8342): Tunable Electrical Conductivity in Metal-Organic Framework Thin Film Devices. Patent No. 9,428,525.

Marie Kane (8344): Synthesis of Soluble Conducting Polymers by Acoustic Mixing. Patent No. 9,441,075.

Leonard E. Klebanoff (8367): Methods and Apparatus for Use with Extreme Ultraviolet Light Having Contamination Protection. Patent No. 9,389,180.

Anup K. Singh (8600) and Anson Hatch (8621): Devices, Systems, and Methods for Microscale Isoelectric Fractionation. Patent No. 9,409,357.

Robert Meagher (8621) and Kamlesh Patel (8625): Micropores and Methods of Making and Using Thereof. Patent No. 9,404,913.

Jason C. Harper (8631): Apparatus Comprising Magnetically Actuated Valves and Uses Thereof. Patent No. 9,389,231.



## For the record

The photo with the Singapore CRADA story on Page 3 of the Nov. 25 *Lab News* was taken by Jacquelynne Hernández.



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LAB DESIGN EXPERT Bill Arndt sits in a biosafety demonstration lab.

(Photo by Randy Montoya)

## A new method of designing high-quality public health labs faster

(Continued from page 1)

ment Program, greatly speeds up Sandia's lab design process. It was first used to design a foot-and-mouth disease diagnostic lab in Kenya. Since details within each module generate drawings that are nearly a third construction-ready, the international partners can have blueprints for builders in about half the time, says Bill.

The modules are all the same dimensions — for ease and speed of design and construction — with designs of secure entry ways, loading docks, restrooms, office spaces, and many different types of laboratories. The labs include seven different molecular diagnostic modules — for testing patient samples for tell-tale DNA or RNA signatures of various diseases — and four clinical collection modules for sample collection, sorting, and processing.

Each lab design process Sandia participates in expands the catalogue of modules. For instance, the Iraqi central veterinary lab required large animal diagnostic modules, which will be available for subsequent design processes. The handover of the final lab design conceptual drawing for the Iraqi central veterinary lab occurred this July.

### Biosafety, biosecurity best practices built in

The primary goal of biosafety is to make sure infectious pathogens stay contained and “the staff only go home with their salary, and nothing else,” says Vips.

Personal protective equipment, standard operating procedures, administrative controls, and engineering controls all help reduce the risks of working with pathogens. And by building in these controls during the lab design process, the work performed in the lab will be safer.

Sandia's lab design experts and their partner HDR Inc. of Omaha, Nebraska, an international architecture and engineering company, have designed biosafety and biosecurity best practices into each module. This includes putting sinks near the exits so that staff can wash their hands as they exit the lab, placing key laboratory equipment away from high traffic areas so that they function properly, and pre-selecting easy-to-clean floors and benchtop surfaces.

Careful placement of modules is another way to make certain biosafety best practices are being followed. Two examples include placing breakrooms away from labs with hazardous or infectious materials and ensuring that labs that generate a lot of infectious waste are located close to sterilization facilities.

Another important aspect of lab design is biosecurity, including physical security. The Sandia lab design process supports secure access to the building and between public space and laboratory space, though it's not expressly built into the prototype modules themselves.

### Building labs that are specific yet flexible to adapt to future needs

In addition to being safe and secure, a new lab must meet the needs of international partners and be flexible enough to adapt to evolving diagnostics over the next several decades of operation.

The Sandia lab design process brings all the stakeholders to the table — the end-users, lab design experts, biosafety experts, sponsors, and architects —

and determines the activities and needs of the facilities and how best to achieve them. The end-users know the most about the diagnostics and services their labs provide, but often they're limited by pre-conceived ideas influenced by their old lab. The external experts have a comprehensive understanding of lab design, but they don't know what does and does not work in the

specific country and environment.

All of the stakeholders meet for three or four intense sessions that last several days each, spread over about six months, and plan everything from defining the general mission of the new building all the way to developing a detailed conceptual layout. Sandia doesn't advance the designs to full construction-ready blueprints; instead the conceptual designs are turned over to architects for completion.

To guarantee that the final lab is going to actually meet the needs of the users and conform to international best practices, Sandia continues to play an advisory role by reviewing and providing comments on the construction-ready blueprints. Also, this support builds local design and construction capacities and helps ensure biosafety and biosecurity best practices are taken into consideration in future design projects, even if Sandia isn't involved, says Bill.

“Bill's tool is a very tangible, hands-on, visual tool to help understand and sharpen the dialogue, because very few facilities are actually identical when you begin to grind down, but they all consist of the same blocks in different permutations,” says Vips. Each module comes with a 3-D rendering of what the space will look like, which helps the end-users and sponsors envision the final product.

Beyond meeting the basic facility needs, Sandia's lab design process focuses on adaptability. Using open labs

for activities that are not endangered by cross-contamination or need for specialized ventilation is one way to build in flexibility. Another is to use mobile instead of fixed casework such as benches and cabinets. An open lab with sections for three different bacterial diseases can adapt to a cholera outbreak by scooting equipment over a bit, whereas three small, specialized bacteriology labs lack that surge capacity, explains Vips.

Making sure a lab lasts 30 or 40 years in the relatively harsh climates of tropical locales demands attention to hazards and environment. In many developing countries, frequent blackouts and brownouts turn biosafety cabinets and other critical equipment into nothing more than “modern art,” says Vips. Backup generators, uninterrupted power supplies for vital equipment, even solar panels are potential solutions, but only if fuel for the generator is readily available and the solar panels can withstand local sandstorms.

### Promoting use of local architects, engineers

“You cannot take something we have in the US and just plop it down as copy-paste,” says Vips. “Asia is extraordinarily humid, everything grows mold and fungus. In the Middle East everything is dusty and dry.”

That is why the Sandia lab design process and prototype tool promotes the use of local architects and engineers. They know the finishes that can mitigate mold growth and air filters that can survive a sandstorm. They know the materials and construction methods that locals can use, repair, and maintain, says Bill.

The prototype design tool also helps ensure that the lab is an affordable and sustainable size. Each module has its own entry in a cost estimation spreadsheet that includes the cost to build and equip it. Very early in the design process, well before the lab is laid out, the spreadsheet can generate a quote for a lab built with those modules. The estimation tool can even be adjusted using local construction costs to improve the accuracy of the quote. This gives the sponsors and the end-users a benchmark figure early in the design process, so they can consolidate or adjust the plan as needed.

During outbreaks, foreign donors sometimes fund temporary labs. These labs can be deployed quickly to critical situations, but are often only a short-term solution. They are typically designed and built in a foreign country, under radically different environmental conditions. Thus, they can meet short-term needs but are not as durable. Local contractors may not know how to repair the labs, or have the right parts.

In addition to designing diagnostic labs, Sandia's International Biological and Chemical Threat Reduction group develops a wide range of methods to combat biological and chemical threats around the globe. They promote the responsible use of biological and chemical agents using train-the-trainer programs and provide templates for standard operating procedures. They have also published a manual on managing biological risks.



**PROXIMITY TO RESOURCES** — The Sandia Science & Technology Park is a 300-plus-acre research park located next to Sandia National Laboratories and Kirtland Air Force Base, giving companies the ability to collaborate with scientists and engineers. (Photo by Norman Johnson)

## A place to grow

## Sandia Science & Technology Park gives local economy a major boost



ALBUQUERQUE MAYOR RICHARD BERRY during a news conference last week talks about the economic impact of the Sandia Science and Technology Park. (Photo by Randy Montoya)

By Nancy Salem

The Sandia Science & Technology Park (SS&TP) has generated \$2.6 billion worth of economic activity and produced more than \$103 million in tax revenue for the state of New Mexico and \$15.2 million for the City of Albuquerque since it was established in 1998. That's the conclusion of a new report by the Mid-Region Council of Governments (MRCOG).

Jobs associated with the research park, which houses private companies and some Sandia National Laboratories sites in a collaborative environment, have paid out \$4.4 billion in wages, contributing significantly to the local economy, the report said.

In 2014 and 2015, the park's economic impact was \$315.2 million and it produced \$13.6 million in tax revenue for the state and \$2.3 million for the city. Wages in the two-year period totaled \$635.1 million, according to the report.

Albuquerque Mayor Richard Berry announced the report's findings Friday, Dec. 2, at the National Museum of Nuclear Science & History in the 300-plus acre master-planned SS&TP.

Berry said the park "is a great example of a successful public-private partnership. Its impact on local and regional economic development is a reflection of Albu-

querque's robust collaborative efforts that ultimately result in valuable jobs for our residents. The City of Albuquerque is honored to be an active partner in the SS&TP."

The park is a partnership of Albuquerque Public Schools, Bernalillo County, the City of Albuquerque, DOE/NNSA, Lockheed Martin Corp., the Mid-Region Council of Governments, the New Mexico congressional delegation, the New Mexico State Land Office, Public Service Company of New Mexico, Sandia National Laboratories, the Sandia Science & Technology Park Development Corp., the state of New Mexico, Technology Ventures Corp., Union Development Corp., and the US Economic Development Administration.

### Jobs, economic activity, wages

"Since its creation, the Sandia Science & Technology Park has provided a home where innovation and technology can thrive and grow," said Bernalillo County Commissioner Maggie Hart Stebbins. "The companies located here are committed to the creation of high-quality jobs, stimulating the local economy and establishing long-term economic prosperity for our community. Bernalillo County is proud to partner with SS&TP in these efforts."

MRCOG assessed the research park's economic impact on the local and state economy from its incep-

tion through the end of 2015. The report also measured the number of Albuquerque-area jobs created in the park, economic activity in the community, and wage and salary levels.

"The park has elevated the regional economy as a whole, and its impacts are felt at the city, county, four-county, and state levels," said Dewey Cave, MRCOG's executive director. "The report draws upon a regional economic modeling tool, the REMI model, which is a widely used and respected analytical tool for measuring local economic impacts." He said the demographic and employment data in the REMI model are updated annually for the region and state.

The report found that salaries for the full-time employees of companies and organizations in the SS&TP last year averaged \$83,100. The park is home to 42 companies and organizations and 2,163 jobs, including about 1,000 Sandia jobs. The park's activities have created more than 4,000 indirect jobs throughout the regional economy, according to the report.

"This science and technology park is the best example New Mexico has of long-term, high-quality job creation," said Sherman McCorkle, chairman of the board of the SS&TP Development Corp. "We remain excited about the opportunity for future growth."

### Widespread investment in the park

Public investment since the park was established has been more than \$89 million, including DOE's contribution for the Master Development Plan, land from Albuquerque Public Schools and the New Mexico State Land Office, and landfill cleanup by Bernalillo County, the report said. Other federal, state, and local government entities helped the park by providing grants or matching funds, the report said. For example, the US Economic Development Administration provided significant grants for secure fiber-optic communications and security network infrastructure. The City of Albuquerque also contributed to infrastructure improvements in the park.

"Investment in the park has been over \$375 million with more than 75 percent coming from private sources," said Rob Leland, Div. 1000 vice president and chief technology officer. "This kind of public-private partnership has a very beneficial impact on the community, and Sandia is committed to continuing to build the park's success through collaboration leading to business growth."

The SS&TP is located next to Sandia Labs and Kirtland Air Force Base, giving park companies the ability to collaborate more easily with scientists and engineers from Sandia, the Air Force Research Laboratory (AFRL), and other Air Force units. Many park companies supply Sandia and AFRL with goods and services or have commercialized technologies that originated at the federal laboratories.

# TRUTHS AND CONSEQUENCES

## REAL CASES AND OUTCOMES

Ethics Advisory and Investigative Services presents *Truths and Consequences*

Truths and Consequences is based on real cases and outcomes. The purpose is to provide an opportunity for employees to learn and better understand Sandia's values and policies in action. Your management, along with Ethics Advisory and Investigative Services, takes your concerns seriously. Below are case facts and responsive actions taken by Sandia.

### ISSUE: MISUSE OF CORPORATE CREDIT CARD

#### Background:

Approximately 7,000 Sandia employees use a corporate credit card (previously corporate travel card) for business-related travel and other approved business purchases. When applying for a corporate credit card (CCC), each applicant signs an agreement to abide by the policies for its use. In FY16, there was an increase in issues related to the inappropriate use of Sandia's CCC, and the Ethics office was asked to investigate a number of those issues. The following details are based on real cases and outcomes.

#### Facts:

The Ethics office found that, while the investigated employees had some legitimate business travel expenses, they also:

- Used their corporate credit card for personal expenses (e.g., utility bills, personal travel expenses, and household items)
- Obtained cash advances for personal use
- Failed to make full payment each month as required
- Failed to submit expense reports for CCC charges in a timely manner

#### Resolution/Discipline:

Based on the facts and severity of each individual situation, a variety of actions were taken that ranged from coaching and counseling to termination.

#### Resources:

- Relevant corporate policies and procedures
- Line manager
- Treasury & Travel Quick Links
  - Corporate Credit Card FAQs
  - Travel FAQs
  - Sandia Travel Page
  - Treasury & Travel POCs



#### Applicable Policies:

Employees violated the following:

**CG100.4.1** Comply with the Code of Ethics and Standards of Conduct and Sandia's Corporate Values: Code of Ethics and Standards of Conduct: You are also responsible for properly accounting for labor, travel, material, and other costs, and ensuring these costs are recorded and charged promptly and accurately.

**FIN100.1.TNT.1** Obtain and Use a Corporate Credit Card: Ensure that personal items are not charged to the CCC; Pay the CCC in full each month.

**FIN100.1.TNT.2** Submit an Expense Report: Submit an expense report as soon as possible after incurring the cost in order to accurately reflect costs to projects.



# GRAND CANYON

## From Rim to Rim

Sandia's R2R WATCH project collects data to study the health, performance of Grand Canyon rim-to-rim hikers

By Patti Koning and Michael Padilla

The R2R WATCH (Rim-to-Rim Wearables at the Canyon for Health) study drew together a diverse Sandia team from across four divisions in partnership with the University of New Mexico's Health Sciences Center and the National Park Service. To capture the unique nature of this ongoing project, *Lab News* reporters Patti Koning and Michael Padilla (both 8524) traveled to the Grand Canyon to witness the R2R WATCH team interacting with rim-to-rim hikers at the start and end of their journeys. This article gives Patti's perspective from the hike start at the Grand Canyon's South Rim and Michael's from the trail end at the North Rim.

### Pre-dawn at the South Rim

By Patti Koning

When the hikers' express shuttle rolls up to the South Kaibab trailhead at 5 a.m. on Friday, Oct. 14, some two dozen hikers pile out into the pitch black to face the South Rim of Grand Canyon National Park. They have no time to waste; their destination, the Grand Canyon's North Rim, is 24 miles away.



CHECKING IN — Dr. Risa Garcia, (far left) and Dr. Kristin Anchors (far right), from the University of New Mexico Department of Emergency Medicine, collect basic medical data on two rim-to-rim hikers who have volunteered to participate in the R2R WATCH study. (Photo by Patti Koning)

But researchers from Sandia and the University of New Mexico (UNM) are waiting near the shuttle stop to ask the hikers for a few precious minutes to participate in a study. The researchers are collecting data on rim-to-rim hikers before, during, and after their journeys.

### Studying rim-to-rim hikers

Called R2R WATCH, for Rim-to-Rim Wearables at the Canyon for Health, the research project involves surveys, basic medical information such as weight and blood pressure, blood samples, wearable fitness devices such as Fitbits, and cognitive tests.

"The overall goal of the study is to determine if a pat-

tern of biological and cognitive markers can be identified that precedes serious health events such as hyponatremia, a decrease of sodium levels in the blood," says Glory Aviña (8962), Sandia's principal investigator (PI) for R2R WATCH.

The three-year research project, funded by the Defense Threat Reduction Agency (DTRA), joined an existing study of rim-to-rim hikers conducted by UNM and the National Park Service (NPS). The UNM/NPS investigation began in May 2015 with surveys of hikers at the start and end of their



DESTINATION PLEASE — University of New Mexico undergraduate students survey hikers starting down the South Kaibab trail to determine the total number of rim-to-rim hikers during the R2R WATCH study. (Photo by Patti Koning)

hikes. In May 2016, an expanded version of the study asked hikers for volunteer blood samples and detailed information about what they ate and drank on their journeys.

The R2R WATCH project has three levels: survey only, which includes basic medical data like blood pressure, oxygen saturation, and weight; survey and blood samples or wearable devices; and survey, blood samples, and wearable devices. UNM manages the collection of nutritional data and blood samples, while Sandia oversees the wearable device study. As this research project grows, UNM and Sandia are synergizing their efforts by sharing data to answer questions from various research domains, from medical assessments to performance in extreme environments.

### An extreme challenge

The rim-to-rim hike is the equivalent of a marathon in distance, with a 1-mile change in elevation and temperatures that range from below 30 degrees Fahrenheit to more than 110 degrees. In addition, the Grand Canyon rim-to-rim hike is an inverse challenge; the first half is easier than the second.

"In most challenging hikes, like Mount Whitney in California, if you become exhausted, you can turn around and head downhill," says Cathy Branda (8620), Sandia's project manager for the study. "In the Grand Canyon, it's very easy to underestimate just how difficult it is to hike out of the canyon."

Rim-to-rim hikers present a unique opportunity for Jon Femling, an emergency room physician and UNM assistant professor of emergency medicine. "Trauma is difficult to study because you generally can't plan for it," he says. "But if people are going to willingly put their bodies through a hike this extreme, we can learn a lot."

Emily Pearce, a former Grand Canyon park ranger who now works for UNM's department of emergency medicine, first thought of studying rim-to-rim hikers in 2014.

"The National Park Service began experiencing a series



of challenges with rim-to-rim hikers, including an increase in requests for assistance, which greatly taxed the rescue resources in the park," she says. "With a small staff, rangers were becoming dangerously fatigued with the number of rescues occurring on peak R2R weekends."

Additionally, Pearce adds, the prevalence of hyponatremia was increasing, especially in rim-to-rim hikers. Analysis of blood samples from the May 2016 UNM/NPS rim-to-rim study showed that one hiker was moderately hyponatremic at the trail end. Acute hyponatremia can cause cerebral edema, or brain swelling, which in turn can lead to coma or death within hours if left untreated.

This type of hyponatremia, known as exercise-associated hyponatremia, requires a specialized set of skills for treatment. Insights from the R2R WATCH study will provide a deeper understanding of the illness to better target preventive education and treatment.

### Danger in the Grand Canyon

According to *Over the Edge: Death in the Grand Canyon*, nearly 700 recorded deaths have occurred at the Grand Canyon. In a 2012 interview with the *Arizona Daily Sun*, the book's authors, Tom Myers and Michael Ghiglieri, said that over the last decade, proportionally more people have been dying from environmental problems — mainly heat — while hiking.

During peak season in the spring and fall, as many as 1,100 people per weekend set out on a rim-to-rim hike. About 350 people are rescued from the Grand Canyon each year, 150 to 180 by helicopter.

"The Grand Canyon is an incredible place, but it can also be extremely dangerous. Access to water is limited on the Bright Angel and North Kaibab Trails and nonexistent on the South Kaibab Trail," says Pearce. "Our goal is to help visitors stay safe while they enjoy this natural wonder."

The results of the UNM/NPS rim-to-rim study have already helped NPS manage the unique and formidable challenges of the Grand Canyon. "We gathered a lot of useful data the first time we did this study, and rangers have now integrated much of this data into their education of visitors," says Pearce. "When rangers tell hikers that the average time for rim-to-rim is 12 hours, people think twice."

The physical challenges of a rim-to-rim hike — extreme heat, rough terrain, lack of water — apply to other scenarios of interest to Sandia, particularly those relevant to the nation's armed services.

### Physiological, cognitive effects of extreme hiking

At first, most of the hikers decline to participate in the R2R WATCH study. They don't want to delay the start of their extreme trek. But later a sort of herd mentality sets in. Once the researchers explain what they are trying to do, a few hikers agree to participate because they think the study is important. Then more join in.

This leads to a frenzy of activity as the UNM team members collect medical data and Sandia staff explain the wearable devices, which range from simple temperature sensors to electromyography shorts that measure voltages across the glutes, quads, and hamstrings.

"We're looking for signs of fatigue, like muscles activating more slowly," says Rob Abbott (1463), a computer scientist in the Cognitive Sciences and Systems department.

Each hiker who opts for the wearable devices is also given an iPod Touch loaded with cognitive tests to take every three hours.

"We're looking for combinations of cognitive and physiological markers that predict decline in this extreme situation," says Kristin Divis (1463), a cognitive psychologist specializing in human performance and visual cognition.

The R2R WATCH study takes place over two days. At the North Rim of the Grand Canyon, 24 miles by trail away, another team waits to collect the wearable devices and post-hike medical data.

### It's the North Rim, baby

By Michael Padilla

It's just a few minutes before noon when the first hiker emerges from the North Kaibab Trail at the Grand Canyon's North Rim. Covered in sweat and grinning ear-to-ear, she knows she has beaten the 12-hour average for the 24-mile hike. In fact, she has crossed the canyon in just under seven hours.



WEARABLE INSIGHT — Glory (8962) and Isaac Aviña (8625) record data from two hikers who completed the rim-to-rim trek. Part of the R2R WATCH study is to determine which commercial off-the-shelf devices work best in extreme environments. (Photo by Michael Padilla)

Glory and Isaac Aviña (8625), a project volunteer, quickly remove the wearable devices from the elite athlete, an ultramarathoner who recently finished a 100-mile run. The hiker then completes her final cognitive test. Study participants take these tests — fast-paced electronic questionnaires involving colors, arrows, and happy and sad faces — before their hikes, at three-hour intervals, and at the end.



TESTING THE LIMITS — A hiker completes a fast-paced electronic cognitive test following the completion of the rim-to-rim hike. (Photo by Michael Padilla)

"The tests measure their working memory, executive function, and other cognitive factors that could be used as early health indicators of performance," Glory says. "For example, we expect that as people are more physically tasked, their reaction time will slow."

Worried about her partner who is still in the canyon, the hiker wipes off her sweat and heads back down to

ensure his safety. Soon everyone gathered at the North Rim cheers as the two hikers climb up the pathway. When the second hiker nearly collapses at the finish, the volunteers rush and tend to his medical needs. He's tired but will be OK, and Glory is at his side to collect the wearable devices.



GROUP TALK — Glory Aviña (8962) talks to participants following the day-long hike. (Photo by Michael Padilla)

### Real-time data collection

Two of the study's goals are to determine which commercial off-the-shelf devices work best in extreme environments and to identify the physiological and cognitive markers that provide the earliest yet reliable indication of health decline.

"The project enables us to use real-time data collection and quantitatively show how markers relate to a non-laboratory, mission-relatable performance task," Glory says. "Findings on individual markers will also inform which wearable devices are most useful both in the attributes they measure and the logistics of use."

She also is using Sandia's expertise in device development and cybersecurity to identify how data can best be collected and protected, especially since network connectivity in the Grand Canyon is inconsistent and unreliable.

### Tracking wearable devices

The R2R WATCH team put together 75 wearable packages that included iPod Touch units loaded with cognitive tests and more than 300 wearable devices — typical fitness gear like watches, chest straps, foot pods, and hats with sensors.

"The wearables we're using are non-invasive fitness devices that can capture the hikers' physical state while engaged in physical activity," says Glory. "DTRA was interested in funding this study because not only does it test which wearable devices are best related to measuring aspects of human performance, but, at the basic research level, it also examines the underlying relationships between cognitive, physiological, and biological markers."

The team focused on devices that measure multiple markers, while considering price and performance reviews. "A device that is really good at measuring heart rate but costly wasn't going to be feasible budget-wise," says Glory. "And we can't disturb hikers' experience at the canyon by having them each wear seven to 10 devices."

Victoria Newton, a student intern in the Cognitive Sciences & Systems department (1463), purchased and calibrated all of the wearable devices. Sandia/California's medical staff, Dr. Stephanie Ball, Emily Rada, and Gina Madison (all 8527), served as subject-matter experts for physical fitness and nutrition. The R2R WATCH study also was heavily reviewed by the human subjects boards at Sandia — led by Craig Nimmo (3300) —

and UNM to ensure safety and ethics.

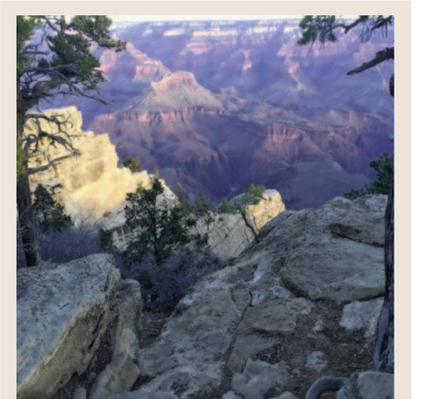
"Both our procurement and medical staff were extremely helpful to us in preparing for this study, and we are grateful for their assistance," says Sandia project manager Cathy Branda.

### Data analysis underway

The team is in the process of evaluating the devices, extracting the data from each wearable, and analyzing the data. They are looking for relationships between physiological and cognitive markers, as well as performance and health outcomes. They will also determine which devices were the most effective in terms of battery life, functionality, and the ability to accurately capture physiological markers.

These results will feed into the next round of data collection for the R2R WATCH study, scheduled for mid-May 2017.

"This initial study of both physiological and cognitive markers was a great success. We collected wearable device data from 50 people, and over 100 people participated in the overall study in one weekend," says Cathy. "But this is just the beginning. This unique setting and our partnership with UNM and the NPS create the opportunity to learn a great deal about predicting medical events. We expect to have more participants and to be more targeted in the data we collect in May."



A VIEW from the South Rim of the Grand Canyon. (Photo by Mike Smith)

## R2R WATCH Study Team

The study is supported by nearly 75 volunteers from UNM and Sandia:

DTRA PM Edward Argenta; Sandia PM Cathy Branda (8620); Sandia PI Glory Emmanuel Aviña (8962); and core team members Rob Abbott and Kristin Divis (both 1463), Clifford Anderson-Bergman (8962), and Victoria Newton (1463).

University of New Mexico Department of Emergency Medicine: UNM PI Jon Femling, emergency room physician; Emily Pearce; and Lucie Jelinkova.

Additional Sandia support: Patricia Benguerel (8532); K. Kelly Riley (10247); Karim Mahrous (8970); Robert Spulak (5331); Isaac Aviña (8625); Kerstan Cole, Eric Moyer, Scottie-Beth Fleming, and Walter Gilmore (all 0431); Kris Hearrean (8971); Joe Schoeniger (8623); and Stephanie Ball, Emily Rada, and Gina Madison (all 8527).

and Sandia — led by Craig Nimmo (3300) —

# NNSA Defense Programs AWARDS of EXCELLENCE

Two individuals and 18 teams were selected to receive NNSA Defense Programs Awards of Excellence at concurrent ceremonies this year in New Mexico and Sandia/California. The special guest speaker was Kent Jones, NNSA Defense Programs Assistant Deputy Administrator for Systems Engineering and Integration. The DP Awards of Excellence honor exceptional contributions to the stewardship and management of the stockpile.



**EDWIN MOBLEY** for his leadership in flexible circuit design, leading to successful product delivery. Ed's professionalism and selflessness have been integral to his participation in high-consequence situations and enhanced the value of his technical contributions. Ed's integrity and commitment to delivering high quality designs and design definitions, within the challenging constraints of Sandia development programs have resulted in Ed enjoying a reputation for being reliable and a recognized expert in his field.

## Individual honorees



**EDWIN PHILLIP CHAMBERLIN** for leadership on the Cost Estimating Analysis Group B61-12 Baseline Cost Report Review. Phil effectively led a team of technical experts with participation from all of the NSE sites to provide a high level, value-added report to the Federal Program Office.

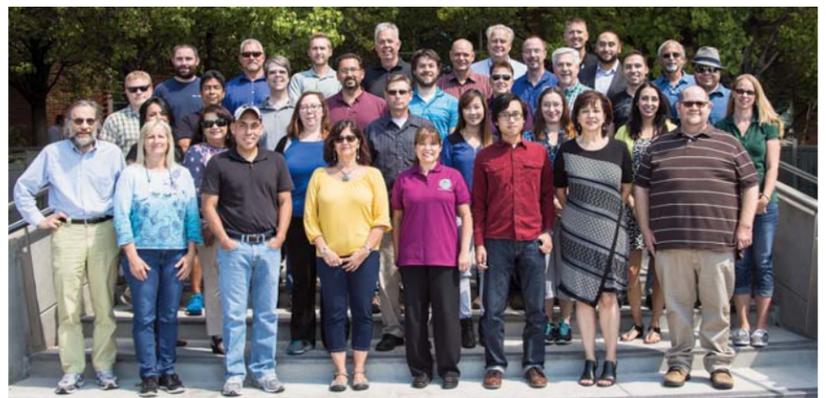
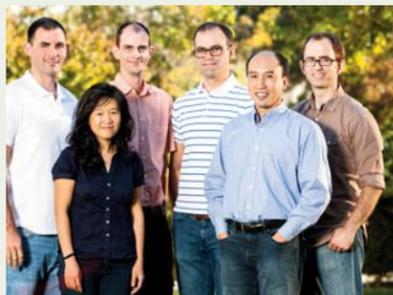
## Team honorees



**The Tonopah Test Range Ops Team.** The team at Tonopah Test Range faced unique hurdles in integrating new program requirements, safety, and recovery considerations, and a 300 percent increase in test event logistical arrangements. This team, composed of both organic and matrixed staff, performed under stringent time constraints and successfully enabled the Labs to stay on critical programmatic timelines.



**The ALT940 Design Team.** The team is recognized for completing the conceptual design phase of the ALT940 Warhead. The team's work resulted in the first implementation of weapon surety on a Navy warhead, a significant advancement in weapon surety. The team's dedication, efficiency, and effective engineering enabled the NNSA complex to deliver on a rare and valuable opportunity, addressing the presidential directive to improve weapon surety. This team has members in both New Mexico and California and is receiving this award under the exceptional achievement category.



**The Code Management Software Team.** The Code Management System manages release codes and cryptographic keys for multiple weapons. This team successfully executed an expansive system upgrade, utilizing a diverse and heavily matrixed team. This team exemplified the value of diversity in teaming — enabling their successful delivery on a high-risk project.



**The FY17 SSMP EMAC SCORE Team.** This team's quantum leap in the quality, processing, and computation of LEP data from each of the NSE sites led to an unparalleled understanding of knowns and unknowns associated with the current and future stockpile as a result of improving the SCORE process. This work set precedence for NSE site collaboration, FPMs, and NA-14 staff and leadership to provide the most definitive, well-informed cost estimates for the SSMP to date. The collaboration resulted in a new depth of relationships across the NSE sites and NNSA, characterized by trust and mission focus. The FY17 SSMP EMAC SCORE Team has members in both California and New Mexico.



**Assessment of an NNSA Asset for Potential Use in Planetary Defense team.** This tri-Lab team provided an assessment of the applicability of an NNSA asset for potential use in planetary defense. The team performed valuable technical analyses to inform decisions on the fate of the asset and arrived at valuable conclusions that enabled NNSA to make an informed and risk-based decision. This team also has members in both California and New Mexico.

# NNSA Defense Programs Awards of Excellence

## Team winners (continued)



**The B61-12 Hardware, Assembly, and Lab Operations Team.** This team epitomized safety, security, and engineering excellence while executing meaningful improvements to all facets of its mission in 2015. This team worked across the enterprise and enabled nearly all the LEP's development and qualification testing efforts. The team expertly managed very large hardware stores and assembled and disassembled large unit quantities. The team significantly contributed to the value and accuracy of test data — critical to advancing the LEP.



**The Powerflow Development on the Z Machine – Next Generation Containment Team.** This diverse team of scientists, engineers, and technologists worked beyond expectation in conceptualizing, designing, analyzing, and creating the experimental hardware that realized a solution to a challenging problem that has plagued the Pulsed Power Science Center for a number of years. This team worked with innovation and fostered a supportive and collaborative teaming environment to the success of the mission.

**The WETL Centrifuge Restart Team.** After a centrifuge drive caught fire at the Sandia National Laboratories Weapons Evaluation Test Laboratory facility at Pantex, WETL's capabilities were significantly reduced. This integrated project team, consisting of Pantex and Sandia personnel, partnered to accomplish the replacement of the centrifuge drive and complete the equipment commissioning and restart. Through excellent communication, cooperation, and determination, the project's completion was delivered on time in spite of the challenges of an extremely aggressive schedule.



**The B61-12 Flight Test Team.** This team successfully completed the flight test that marks a major milestone for the B61-12 Life Extension Program, demonstrating end-to-end system performance under representative delivery conditions. This team's dedication, diverse teaming, and get-it-done culture resulted in delivering the first complete B61-12 flight test, reinforcing the nation's continued commitment to maintain the B61 and provide assurance to our allies.



**The W87/Mk21 W88 ALT 370 MICM Electro Mechanical and Qualification Team.** This team crafted an improved Printed Wiring Board and Assembly test and storage approach to the W87/Mk21 and W88 ALT 370 Missile Interface & Controller Module. The design includes a reusable in-capture system that resulted in significant cost savings in multiple programs.

**The Presidential Policy Directive Team** is recognized for establishing the Nuclear Command and Control, Safety and Security Policy. This team, comprised of only one Sandia employee, Luke Purvis, among a host of NNSA employees, completed a high-risk project with significant impact to the nuclear security enterprise.



**The Pioneering New Frontiers in Hostile Environments Research Team.** This team successfully worked to push the frontiers in hostile environments research, accomplishing several remarkable feats, one of which enables the first use of tritium on the Z facility. Through their notable dedication, they have made truly pioneering improvements to the hostile environments research capabilities of Z whose value will have impact in years to come. This team has members in both New Mexico and California.



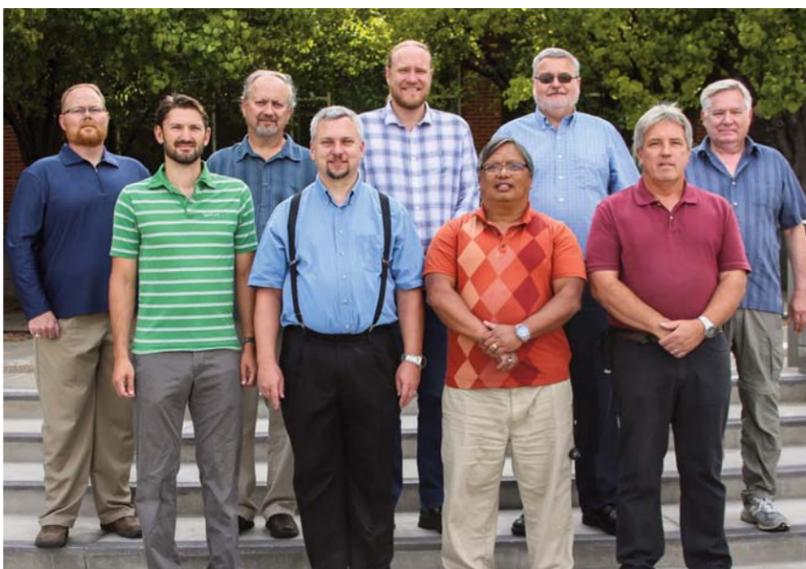
**The MGT Analysis of Alternatives Study Team.** This joint Sandia/NNSA Office of Secure Transportation team completed a first of its kind analysis, setting future standards for similar work. The team began its work well before any formal guidance or process existed for this type of study, and it was the first such effort to fully implement new cost-estimating procedures. The team's evaluations enabled NNSA to make an informed decision in selecting the nation's third-generation secure transportation system.

# NNSA Defense Programs Awards of Excellence

## Team winners (continued)



**The Ultra-Fast X-Ray Imager ASIC Development Team.** The first in-situ diagnostic images were captured in 2015 at both the Sandia National Laboratories Z Pulsed Power Facility and the Lawrence Livermore National Laboratory National Ignition Facility — using Sandia’s ultra-high-speed, high-resolution, digital X-ray framing camera. Sandia’s Ultra-fast X-ray Imaging — UXI camera system — has been identified as the leading transformational diagnostic capability for high-energy-density (HED) physics within the National Plan. This team, earning this award in the **exceptional achievement** category, enabled the HED and inertial confinement fusion research needed for the future, and provides a truly transformational capability for HED science at Z and NIF.



**HERMES III October 2015 Team.** The HERMES III team of researchers came together as part of an international, multi-mission, multi-agency campaign hosted by Sandia at the HERMES III facility. Two years of investment and commitment by this team resulted in an extremely valuable contribution the nuclear security and nuclear forensics mission. In New Mexico, both Sandia and DTRA members are present, as well as members in California.



**Combined Credible Abnormal Environments Team.** The B61-12 Combined Credible Abnormal Environments team demonstrated technical excellence and outstanding inter-agency teamwork to deliver both a product and a new methodology in assessing nuclear weapons safety performance. This team’s multi-agency teaming and successful project delivery have significantly contributed to the success of the B61-12 program and the nuclear security enterprise.



**The ELNG Rapid Tooling Team.** The ELNG Rapid Tooling and Process Engineering team’s commitment to the quality of NW products and significant yield improvement is the result of an innovative and out-of-the-box solution. The team’s success was the direct result of the team’s diversity and commitment to a highly effective partnership. Through their work, this small team has fostered a culture change in product design and development — ensuring future innovation and efficiency.



**The Dropkinson Bar Test Team.** This team invented an experimental apparatus that demonstrates a significant leap forward in Sandia’s ability to develop and validate structural mechanics computational simulation capabilities. The Dropkinson Bar experimental apparatus is unique in its ability and the success of a highly integrated and committed team.

## SANDIA CLASSIFIED ADS

**Note: There will be no Lab News on Dec. 23. The Classified Ad deadline for the January 6, 2017 Lab News will be Friday, December 23 at noon.**

## MISCELLANEOUS

ARMOIRE & HUTCH, dark cherry finish, \$500/both. Hennessey, 505-269-6243.  
LUXURY CONDO RENTAL, Beaver Creek/Avon holiday week, 2- or 3-bdr., 4 nights, no pets, \$500-\$600. Fernandez, 505-238-4722.  
ESTATE SALE, dinette/chairs, \$90; chests, entertainment centers, nightstands, desks, sofas, hide-a-bed, recliner, chairs, bookcases, \$20-\$50; many tools. Joseph, 602-451-6110.  
COLLECTIBLES, lot of ~300 Barbies, dolls, etc., contact for full list & prices, accepting best offers. Martinez, 505-804-5085.  
ESPRESSO MACHINE, Baby Gaggia, older model, foams milk for lattes, photo available, \$50. Stiles, 275-2941, lstyle@outlook.com.  
KEROSENE HEATER, Kerosun, good condition, \$50. Holmes, 873-5255.  
THERMAL COVERALLS, 2, size XL, new, \$30 ea.; UNM Lobo windbreaker jackets, XL & S (w/tag), \$30 ea. Jaramillo, 505-263-2153.  
SMART WATCH, Samsung Gear Fit2, small, black, new-in-box, \$120. Armijo, 505-550-0954.  
UFC 207 TICKETS, 2, Rousey vs. Nunes, Dec. 30, \$300/both. Molina, 505-297-4998.  
LOOM, Bailey/Herald, 4 harness, 4 treadle, 40"W, extra tapes-try beam, hardwood w/steel frame, good condition, \$300. Nellums, 856-1268.

EXECUTIVE DESK, cherry, 5' x 2', \$200; Whirlpool Cabrio washer/dryer, \$300; queen bed & frame, excellent condition, \$40. Ashbaugh, 505-331-3765.  
STEP LADDER, 8-ft. aluminum/fiberglass; 16-ft. aluminum extension ladder, \$40 ea. Maloney, 299-4330.  
HARP, 36-string, full levered, Goldsberry, \$2,700; two 23-string harps, \$650-\$1,000. Spencer, 505-463-5120.  
DINING ROOM TABLE, quality, dark brown, 60"L x 44"W x 40"H, w/6 chairs, good condition, \$300 OBO. Cioce, 505-228-5781.  
MOVING SUPPLIES, boxes & packing paper, free. Rappe, 505-263-9714.  
ADULT SNOWBOARD, Head, 160 cm, no bindings, used, \$70 OBO. Dotson, 850-2939.  
VINTAGE ITEMS, white wicker bassinet, w/stand; Rogers silver-plate flatware, circa 1910; Olivetti portable typewriter; \$50 OBO. Kelly, 299-3527.  
35 MM FILM CAMERA, rugged, Canon AE-1/program, normal, zoom, macro lenses, flash, bag, great for student, \$300/negotiable. Wolfgang, 505-414-1483.  
MINI-DACHSHUNDS, available after Dec. 10 & 17, various colors & patterns, located in Sandoval Co. Gallegos, 505-239-1799.  
SKI EQUIPMENT, complete set, very good condition: skis, boots (11-12), bindings, poles, <1/3 cost, \$175. Marron, 505-345-4006.

## 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: On internal web homepage, click on News Center, then on Lab News link, and then on the very top of Lab News homepage "Submit a Classified Ad."
- If you have questions, call Michelle at 844-4902.

## 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.

POPEJOY TICKETS, front row, center, mezzanine, 8 p.m.: *Motown The Musical*, Feb. 4; *Dirty Dancing*, June 17; \$170/2 seats. Verley, 221-7827.

ROCKING HORSE, pink, Harley-Davidson motorcycle, w/sound, like new, \$75; ride-on, carry-on travel child seat luggage attachment, new in box, \$40. Vigil, 400-0639.

ANTIQUÉ & VINTAGE CLOCKS, working, serviced, weight & spring driven, excellent condition. Ross, 332-0659.

PLANT STAND, Victorian oak, http://www.wmstubblefield.com/sale-items/ for photos. Stubblefield, 263-3468.

COUCH & LOVESEAT, leather, tan, from pet & smoke-free home, good condition, \$450 OBO. Leyba, 908-1930.

## TRANSPORTATION

'02 CHEVY S10 PICKUP, red, bed liner, 1 senior owner, low miles, 60K miles, new tires, excellent condition, \$6,250. Skocytec, 822-1046.

'02 MUSTANG, some peeling paint/fender dent, otherwise great condition, 157K miles, \$2,000 OBO. Sanchez, 505-453-2751.

'69 MUSTANG MACH 1, 351W 2bbl, Gulfstream Aqua, original Albuquerque car, serious inquiries only, \$17,750. Rosales, 505-550-5550.

'07 TUNDRA 5.7, 4x4, 4-drs., dual exhaust, K&N cold-air intake, lift kit, low miles, 67K miles, \$19,000 OBO. Fricks, 238-9583.

'10 CORVETTE, crystal red, 430-hp, heads-up display, removable hardtop, DVD, navigation, Bluetooth, Borla exhaust, \$32,000. Richmond, 505-382-7477.

'11 HYUNDAI SONATA SE, standard 6-spd. transmission, beige, seat warmers, leather, lumbar & Liquicell, 37K miles, excellent condition, \$10,950. Smith, 505-463-0911.

'93 FORD RANGER, 2WD, 5-spd., red, runs well, \$2,250 OBO. Hirschfeld, 505-281-9855.

'04 AUDI QUATTRO WAGON, 6-cyl., 3.0, tinted, leather, sun roof, new tires, runs excellent, garage kept, \$5,900. Mobius, 505-401-6629.

## RECREATION

'72 HARLEY-DAVIDSON ELECTRIC GOLF CAR, runs great, new batteries, beautiful copper paint, \$2,300. Wood, 505-321-9858.

'01 FLEETWOOD SOUTHWIND MOTORHOME, Class A, 36T, 2 pullouts, new tires & batteries, 60K miles, mint condition, \$27,500 OBO. Sanchez, 505-681-3908.

'04 VICTORY VEGAS, pink, 1500 cc, 5-spd., new tires, very low mileage, pretty bike, excellent condition, \$7,500 OBO. Moore, 720-2341.

'15 HEARTLAND OAKMONT 395QB 5TH WHEEL, sleeps 8+, king bed, large stacked washer/dryer, 4 TVs, almost new, \$42,900. Crawford, 505-259-9939.

## REAL ESTATE

3-BDR. HOME, 2 baths, 1,800+ sq. ft., 2-car garage, custom cabinets, Four Hills, solar panel, open concept, fully remodeled, \$265,000. Newell, 331-0187.

3-BDR. HOME, w/office, 1-3/4 baths, 1,770-sq. ft., new water heater & Master Cool unit, well maintained, SE Heights neighborhood, mins. to Louisiana gate, MLS#873495, \$150,000. Chavez, 505-450-2739 or 249-7360.

## WANTED

FURNISHED HOME TO RENT, for visiting family, during summer months of 2017. Burns, 505-600-5736.

FLY FISHING GEAR, need everything, rod, reel, waders, flies, etc. Gutierrez, 505-379-6705, call or text.

ROOMMATE, female, for 2 bdr. apt., 15 mins. from Sandia, \$420/mo. Reif, 505-681-9350, text or call.

RECUMBENT EXERCISE BIKE in good condition. Brown, 505-269-1485.



**Validated!**  
\$155 million in cost reductions



## Recognizing efficiencies across the Labs

Organizations from across the Labs formally submitted more than 125 opportunities for efficiencies in FY16 via the online Operational Innovation application. These opportunities led to a combined, validated cost reduction to Sandia of \$155.9 million, an 83 percent increase over the target of \$85 million.

The Operational Innovation Program, established in 2012, is a corporate-wide effort to capture, evaluate, share, and report on efficiencies at Sandia as required in the Performance Evaluation Measurement Plan. Organization 710 hosts an annual Operational Innovation Recognition Ceremony to recognize the top teams and individuals who contributed to the program during the fiscal year.

This year's recognition ceremony was conducted Nov. 9 in a State Fair-like, 4-H format where project highlights were presented on posters and first, second, and third place ribbons were attached to winning efficiencies.

Operational Innovation program manager Rick Sherwood expressed his appreciation to this year's contributors for their efforts in achieving \$155.9 million in cost saving and cost avoidance initiatives in FY16.

"It's clear that Sandians have demonstrated to our executives and NNSA that Sandia National Laboratories is a champion at operational excellence," Rick says.

DEPUTY LABS DIRECTOR and Executive VP for Mission Support Kim Sawyer, foreground, checks out posters on display during the recent Operational Innovation Celebration. The event highlighted operational efficiencies submitted by some 125 individuals and organizations that led to a combined cost reduction to Sandia of almost \$156 million.

(Photo by Lonnie Anderson)



## FY16 recognized categories, descriptions, and winners included:

## Directed

**Top Mission Support Division:** Largest number of newly validated opportunities submitted in FY16.

• Tim Knewitz, director of Center 10500

**Top Mission Division:** Senior leader who has demonstrated a commitment to developing efficiencies consistently and increasingly throughout FY16.

• Thomas Zipperian, director of Center 2500

**Top Center Business Manager:** The demonstration of significant initiative, ingenuity, and perseverance in the successful implementation of efficiency savings.

• Jericah Townsend (0111)

**Cost Savings:** Cost savings result when there is an intentional action that causes future spending to fall below the level of current spending for the same product or service.

First place - Data Center Consolidation Energy Savings - \$480,000

Second place - VMware Enterprise License Agreement - \$260,748

Third place - Sandia Albuquerque Ombuds Operational Efficiencies - \$249,996

**Cost Avoidance:** Cost avoidances result when there is an intentional action that causes future spending to fall, but not necessarily below the level of current spending.

First place - Property Reutilization - \$21,191,444

Second place - Streamlining the Closeout Process - \$756,720

Third place - Common Engineering Environment - \$563,615

**Leverage:** Leverage results when an innovative process used during one organization's self-directed activity or exercise produces a capability that can be replicated in another organization or across the entire enterprise.

First place - Cost of Quality-3

Second place - Division 2000 ESS&H Governance Structure

Third place - Property Reutilization

All Sandians can access the Operational Innovation application and a variety of associated efficiency reports by typing "OI" into Techweb's address bar.



# Students zip through NM electric car challenge

Story and photos by Lindsey Kibler

**B**errendo Middle School in Roswell took first place in the annual Electric Car Challenge sponsored by Sandia, Los Alamos National Laboratory, PNM, and Intel.

The challenge, held Nov. 19 at Albuquerque's Van Buren Middle School, attracted some 150 middle school students from across the state.

In the challenge, now in its 10th year, students formed five-person teams at the beginning of the school year and were provided basic materials — a lithium-ion battery, a direct-current motor, and other materials such as a chassis and wheels — needed to build their cars.

“Our goal is to expose students to basic engineering. This allows them to see how math and science intersect,” says Sandia Community Involvement Dept. 3652 Manager Amy Tapia.

The teams discussed the designs of their cars, as well as the challenges they faced while constructing and running them. Teams also presented their research about using batteries as a power source.

Other top finishers included the sixth grade academy at Alta Vista Middle School in Carlsbad, which took second place for the second year in a row, and Carlsbad Intermediate School, which came in third.

