

CALLING GAMERS: Future nuclear security experts train with Sandia-designed game

By Jules Bernstein

The next generation of nuclear security experts is being trained in an exciting new way — by playing a first-of-its-kind war game Sandia helped design.

The game, Signal, which goes online this spring after its launch as a board game last year, offers players a chance to make strategic decisions using modern political, economic and military tools. By analyzing players' strategies, researchers seek to better understand how new experimental gaming techniques can deepen insight into conflict escalation and the potential implications of new weapon types and technologies.

The operative word is "modern." Studying the past has limitations when trying to understand how to prevent military aggression today and in the future, said Sandia systems analyst Jason Reinhardt.

"Look at the Peloponnesian War and think about what that has to do with a cyberattack in the 21st century — probably not a lot. But people do that all the time, trying



DEEP THOUGHT — A player strategically plans her next move in the Signal strategic nuclear security game.
Photo by Jules Bernstein

to learn as much as possible from historic case studies," he said.

Even applying Cold War concepts to the modern world is challenging, Jason said. Countries are much more interconnected today, and as a result, international relations are more complex.

The Project on Nuclear Gaming (PoNG) is a University of California, Berkeley-led effort funded by

Carnegie Corp. of New York, with Sandia and Lawrence Livermore national laboratories working in partnership. Earlier work at all three institutions paved the way for the current project.

Rules of engagement

The U.S. has a history of seeking insights into conflict by observing the strategies and tactics of high-ranking

military and government officials engaged in artificial war game scenarios. While the expertise of the participants in these traditional seminar-style, scenario-based war games is valuable, they aren't designed to lead to statistically significant conclusions — there are too few participants, they occur too infrequently and it is difficult to combine the outcomes of games based on different scenarios.

With its new approach, the project has created a way to observe thousands of play throughs by different players in a game involving cyber, conventional and nuclear capabilities. The data collected will allow university and lab researchers to examine the variety of strategies that players employ and scenarios that arise in an escalating conflict when new technologies are available.

The board game is designed for three players who each represent a hypothetical country. Players can build towns and cities as well as defensive infrastructure and military bases. Their arsenals include naval,

— CONTINUED ON PAGE 2

Process modernization

Sandia, Kansas City seek to modernize process with New Product Introduction initiative

By Michael Padilla

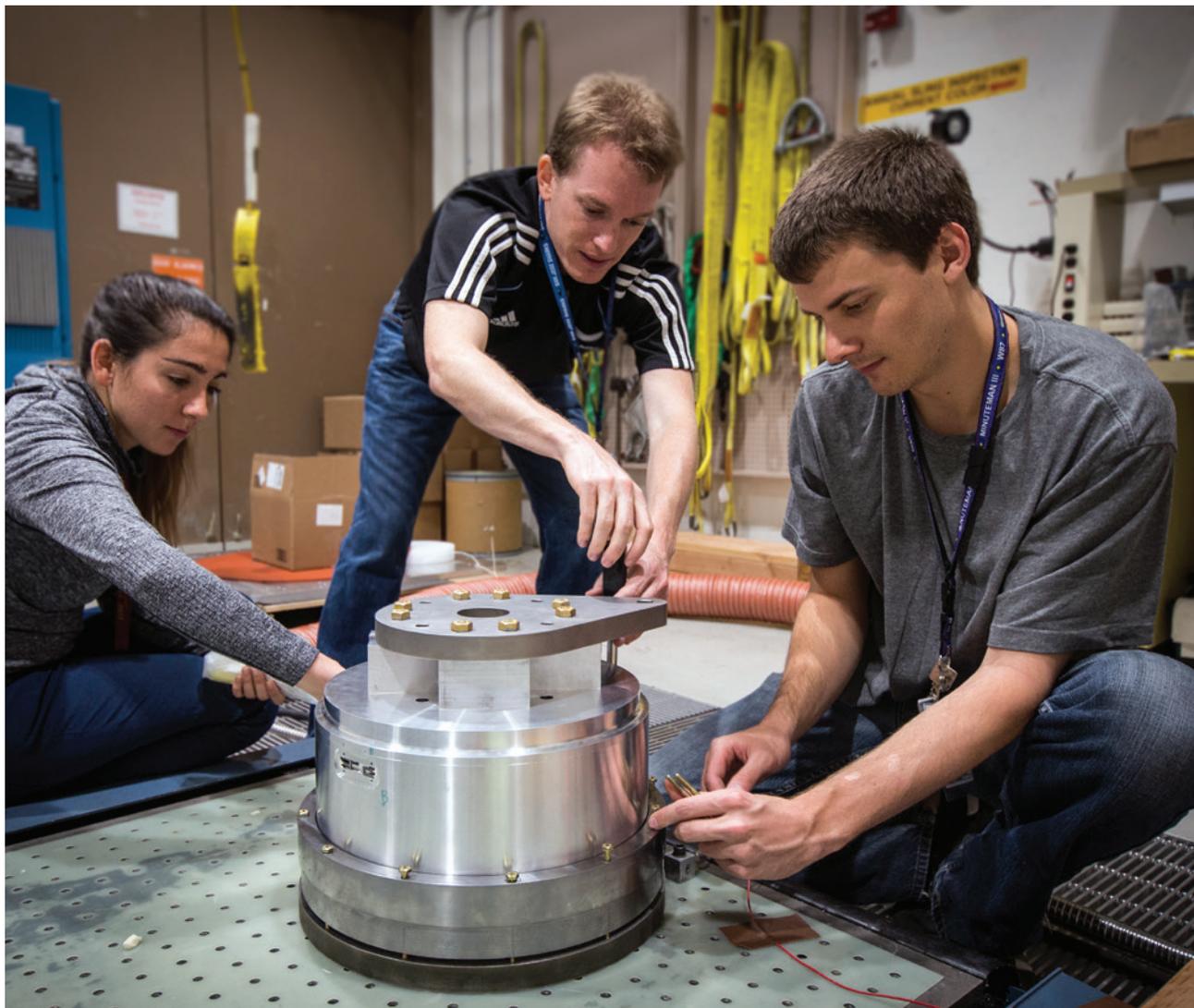
Modernizing the nuclear deterrent also means modernizing the weapon development process.

To this end, Sandia and the Kansas City National Security Campus have established the New Product Introduction initiative. By integrating lessons learned from past weapons programs and industry best practices into the existing process, NPI can help enhance the security, reliability and performance of the nation's nuclear deterrent.

Mike Hardwick, director of weapon systems in California, and Brad Hughes, Kansas City's senior director of nuclear weapons programs, serve as co-chairs guiding the new initiative.

"The goal of NPI is to help NNSA meet its mission in modernizing several weapon programs," said Mike. "We're focusing first on the W80-4 Life Extension Program and then plan to institutionalize successful resources and processes from the initiative for use in future NNSA programs."

The day-to-day work of the initiative falls under the responsibility of 11 workstream teams, each led and staffed by a mix of Sandia and



NEW AND IMPROVED — Sandia and the Kansas City National Security Campus have established the New Product Introduction initiative to help enhance the security, reliability and performance of the nation's nuclear deterrent. A Sandia team prepares a vibration test for the W80-4 Life Extension Program.
Photo by Michael Padilla

— CONTINUED ON PAGE 3

For profit or not for profit: 'Tis the question

By **Dave Campbell, Sandia retiree**

I often said that I didn't want to retire as much as I wanted to do something else, maybe write poetry. I left Sandia about three years ago, 37 years to the day after I started.

I had not much more than left the building when I ran into a Sandia entrepreneurial colleague who offered me stress — I mean work.

Instead, I split my time between "personal tinkering projects" and volunteering. My big tinkering activity to date has involved stripping an Airstream trailer to the bare metal and rebuilding it into a home away from home for our travels, perhaps a story for another time.

In my spare time — if retirees have such a thing, based on my conversations with others — I volunteer for Saranam, a not-for-profit program serving Albuquerque's homeless, supported in part by Sandia through United Way. Admittedly, I started this gig before retiring, based on my association with Sue Campbell, who was at the time their volunteer and family services coordinator.

At Saranam, I do everything from repair and haul furniture to IT support. I could say everything from the mundane to high-tech. Some

days mundane is nice, while other days being able to continue using my engineering skills motivates me.

Prior to retirement, I dabbled in web stuff, but as an analog circuit designer my Sandia career did not directly involve IT work. That just means an opportunity to learn new things, hone skills, and be of value. One of my first tasks out of the gate involved replacing an expensive, aging Windows server. With some research and hacking, I built an open-source Linux based server using a Raspberry Pi for around \$100, with the instructions posted to Github for others to use.

I have taught classes for Saranam staff on subjects Sandians might take for granted: computer security, using Google Drive and Microsoft Office products, etc. A few weeks after I taught an Excel class, one of the staff beamingly said, "I built two spreadsheets from scratch to track information. Aren't you impressed?" Yes, I am.

Last year I built a shopping app to allow enrolled homeless families to shop online for supplies purchased monthly by Saranam for their clients. It tallies orders and builds shopping lists for staff and logs information for client and staff budget planning. The app works; it reduces human error.

Just recently, I rebuilt their website from the ground up, something that would cost many thousands of dollars if they hired someone to do it. Most of my time involved learning a new framework and developing a tool to allow the staff to maintain it easily by themselves.

Last year Saranam began expanding into a second office. Director Tracy Sharp Weaver asked me how to get the antiquated "analog" phone system to work seamlessly in both places. The solution, transition to a cloud-based cellular phone system that can serve multiple locations. "What! You took me by surprise with that one," she said. "I'm thinking

desk phones." Tracy appreciates my contributions, even if it pushes them a little outside their comfort zone at times.

Saranam represents a place where wonderful people work on a wonderful program. They have so much need for every skill imaginable. I can do what I want, when I want, around my other activities. I have a flexible schedule, 0-50 hours a week, which represents a nice perk when the Airstream needs attention. I meet and work with other volunteers who become new friends. I learn new things. I get out of bed every day. (It's harder than you might think when retired.)

About a year ago at a Saranam fundraiser, former Sandians Dave Beutler and Peggy Clews and I discussed life after retirement.

Regarding stress Dave said, "I think the key is having ONE thing to do each day, a reason to get up, but not ten things that have to get done."

I added, "Yeah, of which you can only get to five."

I think many Sandians wait too long to retire, not knowing what they'll do. Retirees have so much to offer; not-for-profits have so much need. It epitomizes the opportunity of having that ONE thing to do every day that we all need to remain active. Not-for-profit, 'tis the answer; 'tis nobler. 



As part of the Labs' Family Stability focus area, Sandia last year provided a \$15,000 grant to Saranam to support the organization's transitional housing program.



FUTURE IS NOW — Signal is designed for three players who each represent a hypothetical country.

Photo by Lorenzo Vidali



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Calling Gamers

CONTINUED FROM PAGE 1

cyber and high-precision, low-yield and electromagnetic pulse nuclear weapons.

Examining players' patterns

Play begins with a diplomacy, or "signaling," phase from which the game takes its name, Signal. Players work simultaneously and indicate their intentions to take different courses of action, such as building cities or military bases, or waging military attacks. They can also form alliances and make trade or other agreements with each other. In the next rounds, players take turns deciding whether to take the actions they signaled previously.

In addition to signaling, some key elements of the game are bargaining, where players react to signals and make deals across the table with others, and uncertainty, because one can't ever really know how someone will respond until they do.

Sandia systems engineer Laura Epifanovskaya reports that in early plays of the board game, the team observed players engaging in a series of build-ups and stand-downs of weapons.

"Players will signal back and forth to each other, look across the table and ask, 'Do we really want to do this?' Then players start removing some of their signals and instead look to make trade deals," she said.

The electronic version of the game will allow researchers to track every move players make and their communications with each other through online chat logs. This will help researchers understand the extent to which signaling affects the escalation and de-escalation they see.

Learning by design

Through designing the game, analyzing data collected during game play and playing the games themselves, graduate students are gaining valuable insight into big questions about human behavior in conflict escalation and the implications of new technologies.

The PoNG team recruits early-career security specialists and graduate students in related fields to play the board game, giving them a chance to practice real-time strategic decision making. Computer science majors from UC Berkeley helped build the e-version of the game, and Jason said the process in some cases is inspiring them to pursue public sector careers.

"Many of these students were planning to work for tech firms, and now they're seriously looking at careers in government and national security because of this project," he said.

With support from Carnegie, the Berkeley students also are analyzing the data collected during game play and discovering deep satisfaction from contributing to a body of knowledge with such far-reaching consequences, Jason said. "My university colleagues tell me this project has enabled them to think about subjects they'd never have otherwise learned about," he added.

Sheryl Hingorani, senior manager for systems analysis, feels the intergenerational nature of the PoNG team is one of the most exciting aspects of the project. "The different levels of experience make this a deep learning exercise for everyone involved," she said.

With the launch of the e-game this month, the team will be looking for players. To learn more or to sign up, visit pong.berkeley.edu. 



INTENSE COMPETITION — Players James Phelan, Munaf Aamir and Rob Forest took part in a challenge at a recent game day. Photo by Lorenzo Vidali



BIRD-SAVING WINDOW DOTS — Sandia Ecologist Matt Bowman examines the window dot pattern recently installed on a building in an attempt to keep birds from flying into windows. This effort was a collaboration between Sandia ecologists and facilities. **Photo by Randy Montoya**

Flying from the glass

Hybrid solution saves energy and birds' lives

By **Jennifer Sawayda**

Bird strikes against windows are an all-too-familiar sound. To birds, the transparent glass looks like open space, and between 500 million and 1 billion birds die each year trying to fly through closed windows.

“Birds mistake windows as an escape route,” said Evan Fahy, Sandia ecologist. “They see it as a clear path ahead they can fly through. It’s even harder when there’s vegetation nearby because the vegetation reflects off the glass, confusing the bird more.”

Sandia is solving this problem at one of its high-strike buildings in Technical Area I, where ecology program staff partnered with facilities staff to place adhesives featuring a dot pattern on the window interiors.

“Birds see these patterns and think something is obstructing their way,” said ecologist Matthew Baumann. “This convinces them to avoid the window.”

The solution combines the use of bird-deterrent film on the interior with heat film installed on the exterior of the windows. The team selected the building not only because it was a high-strike building, but its south-facing windows resulted in more heat coming in.

“We wanted to use heat film on the exteriors of the south-facing windows on the building,” said Gail Granot, corporate architect. “The south-facing windows experience a lot of heat gain and increase the internal temperature of the halls on the second and third floors.”

Hotter internal temperatures require more energy to regulate the building’s environment. To reduce solar heat gain, the facilities team installed Exterior Heat Reduction Film.

In the process, the architects conferred with Sandia’s ecologists. Because bird window strikes are such a hazard, the government has increased bird-friendly guidelines for federal buildings.

The two groups wanted to create a win-win solution for both by reducing the hazard to birds while simultaneously reducing energy costs. Strategic planner and project lead Alicia Brown and her team contacted environmental stewardship to determine the feasibility of installing an ultraviolet window film that would also act as a bird deterrent.

Although manufacturers offer different bird-deterrent patterns, the team opted for a solid quarter-inch diameter circular white dot pattern on three-millimeter thick clear vinyl film. The team believed this pattern, which is recommended by the Audubon Society, would deter the birds without obstructing the view for building residents.

“The width and height between the dots is important,” Matthew said. “We don’t want them

to obstruct the view, but they needed to be close enough so there is not enough room for smaller birds to think they could fly in between the dots.”

Initially, the team investigated whether their suppliers could provide a film that combined a bird-deterrent pattern with heat-reduction features. It soon became clear this was not an option.

“When I researched these types of film, I couldn’t find a heat film that was also a bird deterrent,” Gail said. “Instead, we came up with a hybrid solution that would meet both our departments’ needs.”

The team inserted the UV film on the exterior of the window and the dotted pattern film on the interior so that it was still visible from the outside.

Jerry Gallegos, strategic planner and energy manager, ran computer models to predict that the UV window film will save 6.31 megawatt hours of electricity annually for the building, or the equivalent of preventing approximately 5,000 pounds of coal from being burned in a year.

The team will collect qualitative data to determine whether bird strikes at the building are significantly reduced.

Matthew and Evan are optimistic. Universities and other institutions have seen a marked decrease in bird strikes after installing patterned window adhesives. The facilities team will examine metering data to determine if projected energy models are correct.

The films also have been applied to another key building at Sandia, and the team is looking at applying some type of pattern to the windows of the sky bridge between another pair of buildings.

“We hope to continue working with facilities in this partnership of bird strike mitigations, especially going forward with new buildings,” Evan said. [fb](#)

Process Modernization

CONTINUED FROM PAGE 1

Kansas City professionals. The teams are integrating solutions based on past experience with approaches—such as advanced product quality planning—that have proven successful in other industries. These solutions will be tested and refined through the ongoing W80-4 Life Extension Program and introduced to other nuclear deterrent programs as they ramp up.

Collaboration up and down the line

Tight collaboration between Kansas City and Sandia is woven into NPI, from leadership through to execution. At the highest level of oversight, Sandia’s Dave Douglass, deputy laboratories director, joins with David Johnson, vice president and general manager of Honeywell Federal Solutions, and John Ricciardelli, president at Kansas City, to serve as

NPI executive champions, authorizing the work and acting as the primary interface with NNSA.

The NPI Sponsors, a group that includes Sandia’s Scott Aeilts, Dori Ellis and Steve Girrens, along with Mike and their Kansas City counterparts, holds organizational and budget authority and monitors project execution. Likewise, each workstream boasts leads and staff from both Kansas City and Sandia.

“We are intent on maintaining the strong presence of both organizations throughout NPI,” explained Kansas City’s Brad Hughes. “That way, we know that the needs, ideas and processes of each are firmly entrenched in NPI’s efforts, products and outcomes.”

Investing now for far-reaching benefits

Ramping up to full implementation of the initiative will be an ongoing endeavor, as W80-4

Life Extension Program teams test and refine the tools and processes. Although led predominantly by Sandia and Kansas City, other sites across the Nuclear Security Enterprise are becoming more engaged and part of the NPI solution.

“Overall, the intense focus on improving processes should yield benefits far beyond the initial investment,” said Mike. “Based on value measured in industry, full implementation of the initiative’s tools could cut several years from the nuclear deterrent development process, while enabling production of systems that meet exacting customer requirements.” [fb](#)

For additional information
email NPI@sandia.gov.

All ideas and suggestions
are welcomed.



“MANOS” NEEDS A HAND

*Photos by **Randy Montoya***





Sandia STEM program seeks new mentors

Many of us can thank a teacher or mentor who early in our lives ignited in us a passion for our current professions. Sandia's Manos — or "hands-on" — program is looking for the next generation of Sandia volunteer mentors to provide that spark for science, technology, engineering and math in local middle school students.

Since 1991, Manos has engaged more than 5,000 young students in Albuquerque with gripping hands-on experiences, hoping to increase the pool of Hispanic kids who pursue degrees in such STEM fields as engineering, physics, computer discovery, chemistry, robotics, electronics and more.

Aaron Legarda heard about Manos from his teachers. The South Valley Preparatory School seventh grader has completed modules in chemistry and math and now is exploring robotics. "In the second week, we made teams and started putting together robots with touch sensors and light sensors and color sensors," he said. "It's really cool to make something from parts that moves and counts and measures."

Each year, about 70 Sandia staff members volunteer as teachers, managers and coordinators for the program. "We average 150 students per year and enjoy a regular flow of kids returning for more courses," said

Carla Jordan, a Sandia volunteer coordinator with the program for the last 10 years. "Thousands of kids have been through the program, and we've seen a steady increase in graduation rates over the years. We know we're having an impact."

Manos averages 20 students per class. Classes run 4-6 p.m. each Thursday at the National Hispanic Cultural Center and last anywhere from two to seven weeks, depending on the subject. It's all free to the students.

"There have been times when I wondered if I was making a difference," said Sandia

retiree Joe Maez, who first volunteered for Manos at the beginning of the program in 1991 and still volunteers for the electronics module. "Students always say 'thanks,' and that means a lot, but the more rewarding part is when the parents tell me that the class is all their child talked about for weeks," he said.

Carla added, "We're not just teaching kids about science and technology. We're teaching them about life and how to build a career and a future. They get that — it means something to them." 

Sandia offers up to 30 hours for employees to participate.

For more information on the Manos program and how you can volunteer, please visit

sharepoint.sandia.gov/sites/MANOS/SitePages/Home.aspx

or contact Carla Jordan

at 284-2186; 263-7725 or cmoncay@sandia.gov.

Mileposts

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



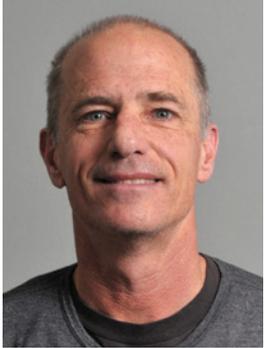
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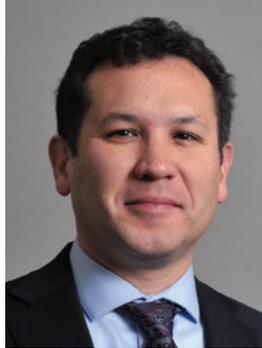
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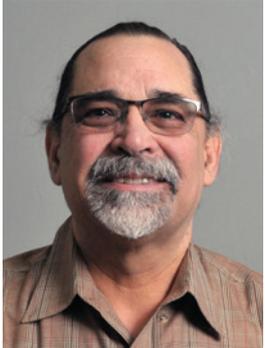
David Bliss 25



Nathan Garcia 20



Michael Kaneshige 20



Curtis Keliiaa 20



Valerie Jimenez 15



Justin Johnson 15



Carla Moncayo Jordan 15



Heather Kraemer 15



Sandy Portlock 15

Recent Retirees



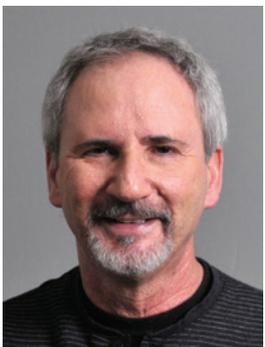
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Michelle Fleming
California photos by
Randy Wong



Constantine Pavlakos 40



Stephen Ward 38



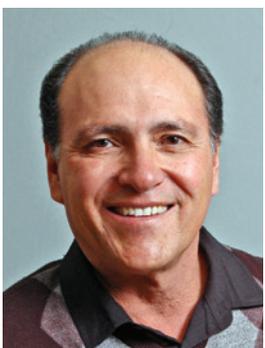
Neall Doren 35



Terry Aselage 34



Pablo Garcia 34



John A. Casias, Jr. 20



Richard Miller 16



Denise Fleming 15

Recent Patents

October — December, 2018

- **Tad A. Ashlock, Charles E. Brady and Kevin Robbins:** System on chip module configured for event-driven architecture. Patent #10089160 B2
- **Steven F. Glover and David G. Wilson:** Method to provide meta-stable operation of a dc microgrid comprising a pulsed load. Patent #10090764
- **Kurt O. Wessendorf:** Supply-noise-rejecting current source. Patent #10090826
- **Joshua Beutler, Edward I. Cole Jr. and Paiboon Tangyunyong:** Scanning method for screening of electronic devices. Patent #10094874
- **Timothy N. Lambert, Cody M. Washburn and David R. Wheeler:** Graphene heat dissipating structure. Patent #10096536
- **Todd Bauer, Thomas Gurrieri, Jason Hamlet and Ryan Helinski:** A temperature insensitive and power supply voltage insensitive physically unclonable function including preselection implemented through a unity-gain negative-feedback operational-amplifier topology. Patent #10103733
- **Timothy J. Boyle and Bernadette A. Hernandez-Sanchez:** Proppant compositions and methods of use. Patent #10106727
- **Andrea Ambrosini:** Thermal energy storage and power generation systems and methods. Patent #10107268
- **David W. Raymond:** Fluid powered motors. Patent #10100850
- **Arden Anderson and Jonathan Ogaldez:** Interconnect system with friction fit backshell. Patent #10116096
- **David Bossert:** Multi-aperture optical system for high-resolution imaging. Patent #10120195
- **Igal Brener and Michael B. Sinclair:** Optoelectronic apparatus enabled by dielectric metamaterials. Patent #10128387
- **Bryan Carson, Melissa Finley and Jason C. Harper:** Amplification of biological targets via on-chip culture for biosensing. Patent #10126299
- **Susan Rempe:** Biomimetic membranes and methods of making biomimetic membranes. Patent #10130916
- **Adam Cook:** Two-fluid hydrodynamic printing. Patent #10130961
- **Jeffrey P. Koplou:** Axial flow heat exchanger devices and methods for heat transfer using axial flow devices. Patent #10132574
- **Christian Lew Arrington, Eric Langlois, Todd Monson and Jamin Ryan Pillars:** Electrodeposition processes for magnetostrictive resonators. Patent #10132699
- **Charles J. Mueller:** Ducted fuel injection with ignition assist. Patent #10138855
- **Matt Eichenfield and Brian D. Homeijer:** Vertically integrated optoelectronics package for mems devices. Patent #10139564 B1
- **Christopher Dyck, Matt Eichenfield and Christopher Nordquist:** Microsystems-based method and apparatus for passive detection and processing of radio-frequency signals. Patent #10141495 B1
- **Stephen Buerger, Kevin J. Dullea, Clinton G. Hobart, Michael Kuehl and Steven James Spencer:** Energy efficient robot. Patent #10144464
- **Joshua Beutler, Edward I. Cole Jr. and Paiboon Tangyunyong:** Defect screening method for electronic circuits and circuit components using power spectrum analysis. Patent #10145894
- **Jonathan Joseph Coleman and Adam M. Rowen:** Electroplated au for conformal coating of high aspect ratio silicon structures. Patent #10147510
- **Matt Eichenfield and Michael David Henry:** Trimming method for microresonators and microresonators made thereby. Patent #10148244
- **Eric John Schindelholz and Erik David Spoerke:** Nanocomposite conformal corrosion barrier coating. Patent #10150873
- **John Moses Anderson, Ronald P. Manginell, Matthew W. Moorman and Douglas Read:** Sealed micro gas chromatography columns and methods thereof. Patent #10151732 B2
- **Todd Pitts and Eric A. Shields:** Noncircular aperture imaging system. Patent #10154193
- **Matthew David Carlson:** Systems and methods for spray cooling. Patent #10156402
- **Nelson S. Bell, Paul G. Clem, James J.M. Griego and Mark A. Rodriguez:** Vanadium oxide for infrared coatings and methods thereof. Patent #10160660
- **Ronald P. Manginell and Matthew W. Moorman:** Microsampler and method of making the same. Patent #10161835
- **Charles J. Mueller:** Ducted fuel injection. Patent #10161626
- **Marcus Alexander Chavez, Timothy T. Covert and Michael David Willis:** Sensor system that uses embedded optical fibers. Patent #10161924

Note: Patents listed here include the names of active Sandians only; former Sandians and non-Sandia inventors are not included.

Following the listing for each patent is a patent number, searchable at the U.S. Patent and Trademark Office website (www.uspto.gov).



EXCITING CAPABILITIES — The new Sandia Wave Energy Power Take-Off (SWEPT) lab offers specialized testing for power systems, saving developers time and money. **Photo by Norm Johnson**

New lab offers mobile testing for devices that turn ocean waves into electricity

By **Mattie Hensley**

A new Sandia facility — the Sandia Wave Energy Power Take-Off (SWEPT) Lab — offers mobile, specialized testing for systems that produce power from wave energy.

The new facility “allows water power developers and researchers to test their devices and tune their controls software by leveraging the national labs,” said Peter Kobos, manager for water power technologies. “This will help industry and researchers set themselves up for successful field demonstrations.”

Marine and hydrokinetic technologies convert the energy of waves, tides and river and ocean

currents into electricity. Potentially, they can provide millions with locally sourced, renewable and reliable energy.

The wave energy converters are unique because they convert the oscillatory mechanical energy from ocean waves to generate electricity. This makes them different from such technologies as wind turbines or hydroelectric power plants that harness a relatively steady input of mechanical energy. Because of the unique way they convert energy, the converter power take-off systems require specialized design and testing methods and facilities such as the SWEPT Lab.

The power take-off systems comprise the generator and gearing stages that transform the energy

of the ocean’s waves to electrical energy. Power take-off systems define key system dynamics that determine the amount of power a wave energy converter can produce, which affects the leveled cost of energy.

“The SWEPT Lab is an exciting new capability that will allow WEC developers to test their systems before they commit to the tremendous expense of a test in the ocean or a wave tank. This should decrease the costs and speed up the development of this promising renewable energy technology,” said Amy Halloran, program manager for renewable energy technologies.

The leveled cost of energy measures how much money must be earned per unit of per kilowatt or megawatt of electricity for an energy project to break even. It is often used to compare different energy production methods. Reducing the leveled cost to produce energy is the key to commercialization of wave energy converters.

Reducing costs, accelerating technology development and decreasing the time needed for testing and development of marine energy technologies will help unleash the nation’s potential for future growth in use of marine energy resources, according to the DOE water power technologies office.

Research and engineering efforts in Sandia’s water power technology program help the emerging marine hydrokinetic industry overcome technical barriers to commercialization, she said.

Located at Sandia’s National Solar Thermal Test Facility, the SWEPT Lab can be moved where it is needed or most convenient. Peter said mobility is a key feature for large systems that are assembled at a shipyard. Composed of five mobile units, the lab includes the test container, two generators, a power unit, control unit and tool unit.

Prior to commissioning, the lab completed a series of tests to characterize the system and verify that it can conduct hardware-in-the-loop testing and system identification testing. The initial tests showed excellent performance, Peter said. [T](#)

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COUCH, suede-like, taupe, \$120; high-back Queen Anne chair, melon color, \$110; roll-top desk, \$300; photos available, can negotiate. Brewster, 505-238-4704, ask for Julie.

BLOOD PRESSURE KIT: stethoscope, arm cuff, zippered storage case, never used, Walgreens brand, certified, \$14. Wagner, 505-504-8783.

MOVING: TV/hutch, \$300; 2 twin XL adjustable beds & mattresses, 1 yr. old, used for guests, makes into CA king, \$600/both. Miller, 505-514-8744.

VACATION CONDO, Cancun Royal Sands Resort, Memorial week, May 25-June 1, 2-bdr., 2 baths, sleeps 6, no all-inclusive fee required, \$1,900. Limon, evlimon@msn.com.

ANTIQUE PARLOR TABLE, oak, ball & claw foot, nicely restored, \$199. Stubblefield, 505-263-3468.

BATHROOM VANITY, double sink, linen white cabinets, white marble top, 83-in. wide, brand new, \$150 OBO; treadmill, ProForm Crosswalk 405E, folding, more, \$75 OBO. Low, 505-379-0441.

SECTIONAL SOFA, 4-pc., \$300; entertainment center w/TV stand, \$150; Visio 36-in. flat screen TV, \$50. Graham, 505-293-7302.

TRANSPORTATION

'03 CHEVY IMPALA, 6-cyl., 144K miles, very good condition, great MPG, \$3,500. Wright, 505-916-1691.

'07 BMW X3 3.0 si, AWD, AT, black, ~117K miles, \$6,500. Stotts, 505-363-4303.

'18 GMC SIERRA ELEVATION EDITION, 4WD, 9,700 miles, excellent condition, see on Craigslist #6826524441, \$33,000. Martinez, 505-431-7750.

'15 HYUNDAI SANTA FE SPORT, FWD, 4-cyl., AT, pearl white, 74.6K miles, great condition. Sanchez, 505-974-0874.

RECREATION

'16 BMW RS1200, GPS navigation, keyless, ABS, crash bars, HB cases, adventure screen, garage kept, <3K miles, \$18,000. Laros, 505-553-3770.

REAL ESTATE

4-BDR. HOME, 2,508-sq. ft., 2-car garage, FP, central heat, refrigerated air, granite counters, 98th & Ladera NW, newly built, \$259,000 terms. Sanchez, 505-515-5997.

WANTED

FRENCH TUTOR, for starter. Lin, jianjun1023@gmail.com.

AD RULES

1. Limit 18 words, including last name and home phone (web or email address counts as two or three words, depending on length).
2. Include organization and full name with 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. The same ad may not run 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 and retired Sandians only.
10. Housing listed for sale is available without regard to race, creed, color or national origin.
11. Work wanted ads are limited to student-aged children of employees.
12. We reserve the right not to publish any ad that may be considered offensive or in poor taste.

W80-4 Life Extension Program achieves major milestone



CHECKING IT TWICE — The W80-4 Life Extension Program team completed on-time delivery of multiple test assets to the U.S. Air Force, ensuring the program is well-positioned for success in the development engineering phase. **Photo by Randy Wong**

By **Jana Cuiper**

The W80-4 Life Extension Program achieved a major milestone last month when the joint DOE and Department of Defense Nuclear Weapons Council approved the program to enter Phase 6.3, development engineering. The approval follows multiple briefings by the W80-4 leadership team to program stakeholders at NNSA headquarters and the Pentagon.

The move into Phase 6.3 signals the program's readiness to advance the conceptual design developed during Phase 6.2, the feasibility study and option down-select. Through analysis, testing and qualification activities, design teams at Sandia and Lawrence Livermore national laboratories will gather critical qualification evidence and ensure designs meet extensive customer requirements. The teams also will partner with multiple NNSA production agencies to ensure production readiness of the design.

Members of the management team who helped lead the three-year project expressed pride in the team's accomplishments and praised the hard work and dedication of the core team, as well as the individuals and teams across the Labs who supported program.

During Phase 6.2, the W80-4 team developed design options and conducted trade studies and analyses. The technical and program teams grew substantially during the Phase 6.2 work to meet the needs of a thriving program, deploying staff to address risk, requirements, quality, nuclear safety and security, surveillance, qualification, configuration and information management, change control and more.

Phase 6.2 included a design definition and cost study period, Phase 6.2A. Throughout this phase, the team pursued rigorous schedule and cost analysis activities using resource-loaded schedules. They conducted a formal schedule and cost, risk and uncertainty analysis to estimate program cost. The work conducted throughout Phase 6.2 and Phase 6.2A culminated in the submission of the weapon design and cost report package, which included the Phase 6.2 study report and the major impact report, documents required before entering Phase 6.3.

The W80-4 program management further prepared for Phase 6.3 by restructuring roles and responsibilities. Weapons engineering centers in California and New Mexico are partnering to support the growth and execution of the W80-4 program. The New Mexico center brings valuable

lessons learned and broad experience from other recent modernization programs.

As a joint DoD/DOE unit, the Nuclear Weapons Council facilitates interagency cooperation and coordination. The council also establishes priorities for maintaining and managing the U.S. nuclear weapons stockpile. It holds approval authority for the progress of life extension programs throughout the weapon development process.

Sandia and Lawrence Livermore are the design agencies for the W80-4 Life Extension Program modernization, with responsibility for development of nonnuclear and nuclear components, respectively. The W80-4 LEP is the first modernization program in more than 20 years to refurbish a warhead in parallel with development by the U.S. Air Force of a new delivery platform — the long-range stand-off cruise missile.

In addition to working closely with Air Force partners and contractors, the Sandia W80-4 team collaborates across the nuclear security enterprise with Lawrence Livermore and Los Alamos national labs, Kansas City National Security Campus, Pantex Plant, Y-12 National Security Complex, Savannah River Site and the NNSA program office in Albuquerque. [fb](#)

Air Force officials learn about Sandia/CA weapons contributions

by **Emmeline Chen**

U.S. Air Force Lt. Gen. Richard M. Clark, deputy chief of staff for Strategic Deterrence and Nuclear Integration, visited Sandia California last month to familiarize himself with the site's contributions to national security through nuclear weapons.

Clark's California visit was jointly hosted by Dori Ellis, associate labs director for Integrated Security Solutions, and Steve Girrens, associate labs director for Nuclear Deterrence.

Billy Mullins, the Air Force associate deputy chief of staff for Strategic Deterrence and Nuclear Integration, and Lt. Col. Shaun Easley, chief of the Air Force Stockpile Science and Technology Branch, accompanied Clark.

Dori welcomed the visitors with a presentation about Sandia/California's history, capabilities and contributions to national security.

After lunch, Dori and Steve led Clark and his associates to the National Security Resource Center, where they were briefed on stockpile systems by Ben Markel, senior manager. Mike Hardwick, director of weapons engineering for California, provided an overview of modernization programs. [fb](#)



CALIFORNIA CONFAB — At Sandia/California, associate labs directors Steve Girrens (left) and Dori Ellis (center) recently co-hosted U.S. Air Force Lt. Gen. Richard M. Clark (second from left), deputy chief of staff for Strategic Deterrence and Nuclear Integration, along with Billy Mullins (second from right), associate deputy chief of staff for Strategic Deterrence and Nuclear Integration and Lt. Col. Shaun Easley (right), chief of the Air Force Stockpile Science and Technology Branch. **Photo by Randy Wong**