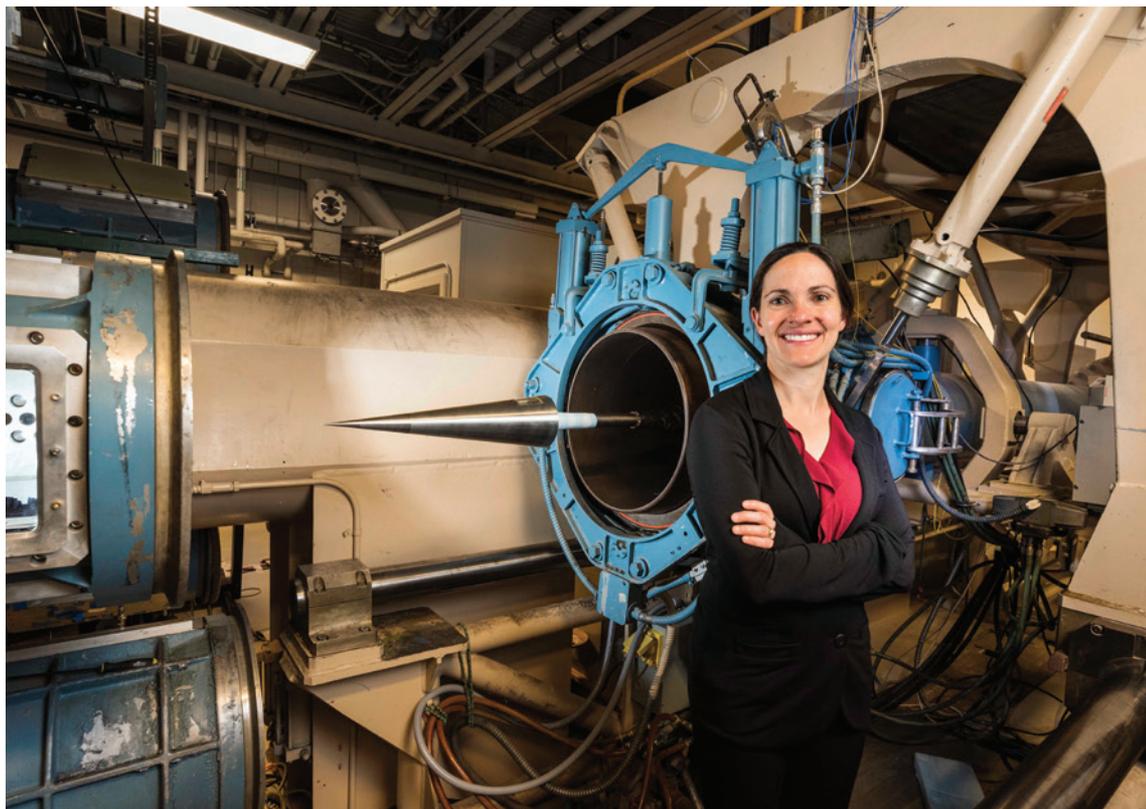




Matt Gomez earns
recognition for
Z machine work
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High-speed experiments improve hypersonic flight predictions



FLYING FAST — Aerospace engineer Katya Casper has become known for her innovative techniques measuring the effects of pressure on hypersonic vehicles at Sandia wind tunnels. **Photo by Randy Montoya**

By **Michael J. Baker**

When traveling at five times the speed of sound or faster, the tiniest bit of turbulence is more than a bump in the road, said the Sandia aerospace engineer who, for the first time, characterized the vibrational effect of the pressure field beneath one of these tiny hypersonic turbulent spots.

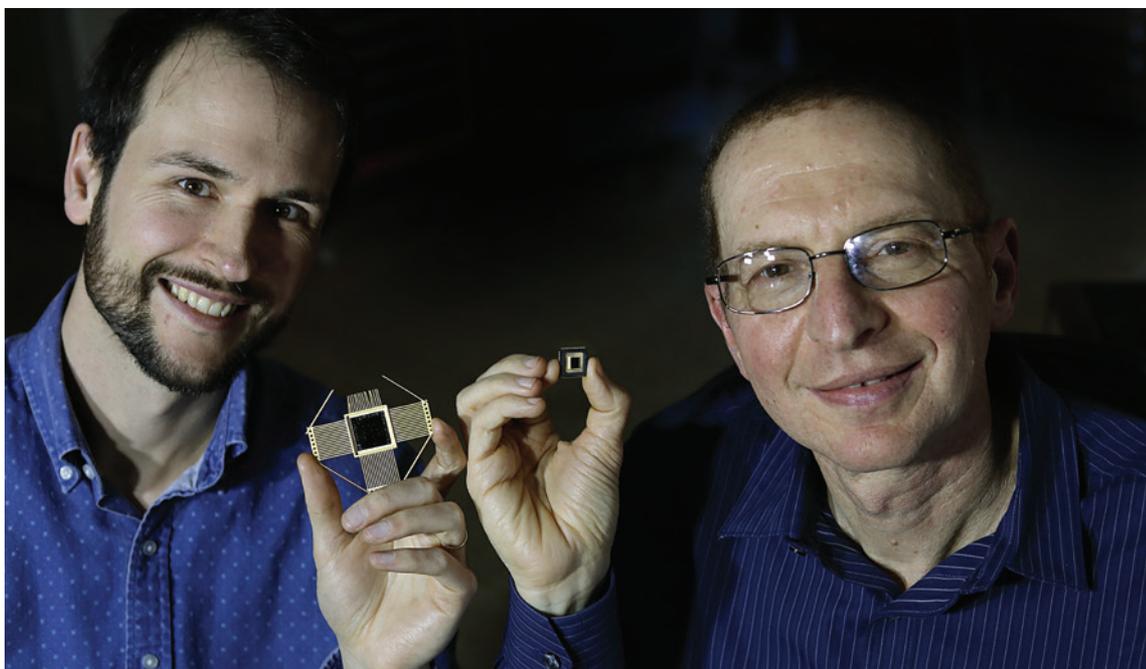
“The problem is that these patches of turbulence are really fast and really small,” Katya Casper said.

“There are thousands of turbulent spots every second in hypersonic flow, and we need really fast techniques to study their behavior.”

The pressure field is key to understanding how intermittent turbulent spots shake an aircraft flying at Mach 5 or greater, Katya said. Hypersonic vehicles are subjected to high levels of fluctuating pressures and must be engineered to withstand the resulting vibrations.

— CONTINUED ON PAGE 4

Breakthroughs in neuromorphic computing demonstrate high efficiency, performance



BRAINY ARRAY — Elliot Fuller (left) and Alec Talin show the ionic floating-gate memory array. **Photo by Dino Vournas**

By **Paul Rhien**

As the demands on computers rapidly change to more data-centric tasks — such as image processing, voice recognition or autonomous driving — the need for more efficient computing grows just as rapidly.

Given the limitations of traditional computing, scientists and commercial manufacturers have focused on the field of neuromorphic computing,

which mimics the way the human brain carries out data-centric tasks.

Sandia researchers have collaborated with Stanford University and University of Massachusetts, Amherst, to address the challenges and recently have made breakthroughs in neuromorphic computing and the broader fields of organic electronics and solid-state electrochemistry.

— CONTINUED ON PAGE 5

Forbes names Sandia a top large employer for 2019

By **Valerie Alba and Myles Copeland**

Three months after being recognized by Forbes as a top workplace for diversity, Sandia has earned another Forbes distinction, this time a spot among the 500 Best Large Employers.

According to Forbes, the winners were chosen based on an independent survey of approximately 50,000 U.S. employees who work for companies that employ at least 1,000 people in their U.S. operations. The survey, fielded across all industry sectors, sought anonymous input on employees’ willingness to recommend their employer and their opinions on working conditions, salary and development potential.

Sandia was the only DOE lab and the only New Mexico-based entity to make the list.

This year, the Labs added a four-day-week work schedule option and paid family leave, which allows employees time off to care for newborn, adopted and foster children, as well as seriously ill family members. These enhanced a suite of work-life-balancing benefits that already included the 9/80 work schedule, an onsite health clinic and preventive health and fitness classes.

“Given the importance and complexity of Sandia’s work, we’re competing for talent, not just with other national laboratories, but with all leading tech and R&D employers,” said Rob Nelson, director of Human Resources. “It’s great to be recognized, but we know we need to keep working to understand and provide the benefits our employees and candidates care about.”

Also in April, recruiting website Zippia selected Sandia as the best company to work for in New Mexico, citing the Labs’ workplace diversity, variety of career paths and company performance. Sandia was rated 9.9 on performance, 9.4 on salaries and 9.6 on diversity by Zippia.

“It has many types of jobs for workers with expertise in science and technology,” wrote Microsoft Money Talks News in announcing Sandia’s rating on Zippia. “It offers career possibilities in more than a dozen specialties, including nuclear engineering, geoscience and cybersecurity. Those hired on have access to one of the best-paying, most diverse and top-performing companies in Albuquerque,” the online news item said.

Sandia also received a 2019 Gold Award from Family Friendly New Mexico, presented during the nonprofit organization’s annual awards luncheon April 18. The top-level recognition is reserved for employers with family friendly policies in four different categories, including paid leave, health support, work schedules and economic support.

“These back-to-back recognitions underscore Sandia’s commitment to fostering a workplace that’s rewarding, engaging and welcoming to all employees,” said John Myers, senior director of Human Resources and Communications. “Sandia’s national security mission attracts some of the top technical talent, and when employees come to Sandia, they join a vibrant team focused on serving the nation through excellence and innovation.”

STRATEGIC PRIORITIES

Sandia's Strategic Priority No. 1 is where the rubber meets the road

By **Dave Douglass**

Sandia has an exciting future filled with trailblazing work that will impact national security for decades to come. Our teams are advancing research into nuclear deterrence, intelligence science, threat detection, pathfinder systems and foundational engineering, science and technology — and evolving the institution to become a better place to work and get work done. We're looking ahead 20 years and more to how we can best address the coming national security challenges.

Our Strategic Direction is forward-looking, detailed and robust. It's not wishful thinking or a hollow promise of action that will never be taken. Sandia's strategy will impact the future because it has a foundation in the present.

The foundation is Strategic Priority No. 1: Deliver on today's commitments. This priority spells out, up front, that as a Federally Funded Research and Development Center we must fulfill our current missions to have the opportunity to take on the challenges of tomorrow. This is our top job.

While no single priority is more important than the others, No. 1 is our price of entry. We lose the credibility required to effectively meet our FFRDC obligation of anticipating future issues if we can't live up to our current

commitments. Priority No. 1 opens the door to a long future of technology stewardship. Our ability to deliver today makes us credible tomorrow.

Simply put, Priority No. 1 puts first things first. Sandia will meet its programmatic, operational and contractual commitments — this year, next year and into the future.

Programmatically, we have the highest workload at the Labs in 30 years due to life extension and other weapons programs and major national Strategic Partnership Projects work. We've named eight top Labs programmatic commitments including the B61-12, W88 ALT 370, Mk21 Fuze, W80-4 LEP, MGT, P19, MESA conversion and hypersonics.

Operationally, we are tackling numerous processes to improve the way the Labs perform. Many are outlined in the FY19 Goals and Objectives and impact everything from small-business contracting to program management to safety and human resources.

Contractually, we are addressing requirements in the Performance Evaluation Management Plan — the negotiated criteria by which our sponsors, DOE, NNSA and SFO, appraise our ability to manage and operate the Labs. Collectively, our program commitments, strategic goals and objectives and PEMP goals and objectives represent Sandia's highest-level commitments to our sponsors.

Sandia's seven Strategic Priorities are the result of a long and thorough journey involving hundreds of people. They recognized that forward-looking goals couldn't be accomplished without attention to the present, to managing infrastructure, recruitment, safety and security and other aspects of our day-to-day operations. It's no accident that the priorities are bookended by shorter-term operational tasks and a longer-term vision. No. 1 exists for the other priorities to work.

Strategic planning is sometimes criticized because plans are written, then sit on a shelf and nothing changes. That's partly because strategy is future-oriented and often lacks clear actions. We don't intend to fall into that trap. Each priority, including No. 1 is executed via concrete actions



DEPUTY LABS DIRECTOR DAVE DOUGLASS — "Think big and do world-changing work."

Photo by Randy Montoya

and progress is updated quarterly at a strategic management review. Another criticism of strategic planning is that it is developed and executed by only a few individuals. Again, Sandia's strategy is different. Hundreds of Sandia staff and managers, and experts from around the country, contributed to its development, and every staff member will be able to contribute — look no further than priority 1. This strategy belongs to you and we want you to be involved. Attend a Lunch and Learn, a Coffee Talk or other strategy event. We need team members and thought partners to bring our strategy to life. Email the strategy team at strategy@sandia.gov for more information.

Priority No. 1 applies to us all and is the foundation for innovation over the next 20 to 30 years. Because of the foundation provided by Priority No. 1, you can think big and do world-changing work. I challenge you to be a part of enabling our strategy — deliver on what we have today AND go after the big ideas for the future. 

This is the first in a series of columns exploring Sandia's seven Strategic Priorities — areas where Labs leadership believes it is important to dedicate institutional time, attention and resources to significantly impact national security. The priorities look ahead 20 years and are part of Sandia's Creating the Future strategic direction document.

Read about Labs strategic planning in the Jan. 31 Lab News.

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California middle school students get look at STEM careers

By **Michael Padilla**

Photos By **Dino Vournas**

From designing a paper airplane to learning all about research in an ultrafast laser lab, more than 35 students recently took part in Career Exploration Day with Citizen Schools at Sandia/California.

The nonprofit Citizen Schools partners with middle schools across the nation to extend learning for youth in underserved communities.

The goal of the event was to expose students to careers in science, technology, engineering and math. Students took part in hands-on science demonstrations and toured two labs in Sandia's Combustion Research Facility. During the event, students questioned researchers about STEM careers.

"Sandia is committed to delivering STEM educational outreach opportunities designed to increase the number of underrepresented students who successfully pursue STEM careers," said Dori Ellis, associate labs director for Integrated Security Solutions. "Career Exploration Day with Citizen Schools was an excellent opportunity to give students firsthand exposure to a national laboratory and provide students with career-building skills and takeaways to use in their future academic paths and careers. Perhaps as important, the individuals who engaged with the students represent a diverse group of men and women that are role models for what these students can aspire to be."

Systems engineer Camron Proctor welcomed the students to Sandia and spoke about his work at the Labs.

"I see a lot of myself in these kids, and their background resonates with me," Camron said. "I wanted to highlight the similarities so that they could see what I didn't at their age. It is important to me that they see someone who is, like them, deeply engaged in science and engineering."

Systems engineer Raheel Mahmood and Adriana Del Cid, community relations intern, welcomed the students and led the paper airplane design demonstration.

During the event, Dori presented a check for \$15,000 to Maria Drake, executive director of Citizen Schools, to support ongoing science programs.

"It was super exciting to hear students express their intentions of sharing their experiences with siblings and friends," Adriana said. "I heard a specific student looking forward to showing her younger brother how to make a paper airplane using the airplane demo sheet. Hearing this highlights the importance of having these outreach events and field trips for students because they not only impact the students attending, but also have the power to reach others in the students' lives, sparking their curiosity in STEM."

Sandia supports Citizen Schools as part of the Labs' commitment to educational success. This effort includes recruiting current members of the workforce to volunteer to teach 10-week apprenticeships at underserved middle schools. A team of Sandia volunteers also put together the career exploration event.

The event was spearheaded by Kayla Norris, community relations specialist, and Adriana. Volunteers included Neil Cole-Filipiak, Mark Musculus, Chris Kliever, Holly Gothard and Patrick Joseph Blonigan. Zoe Pilla served as the Citizen Schools coordinator. [f](#)



DIESEL POWER — Researcher Mark Musculus describes research conducted in the Heavy Duty Diesel Engine Lab in Sandia's Combustion Research Facility.



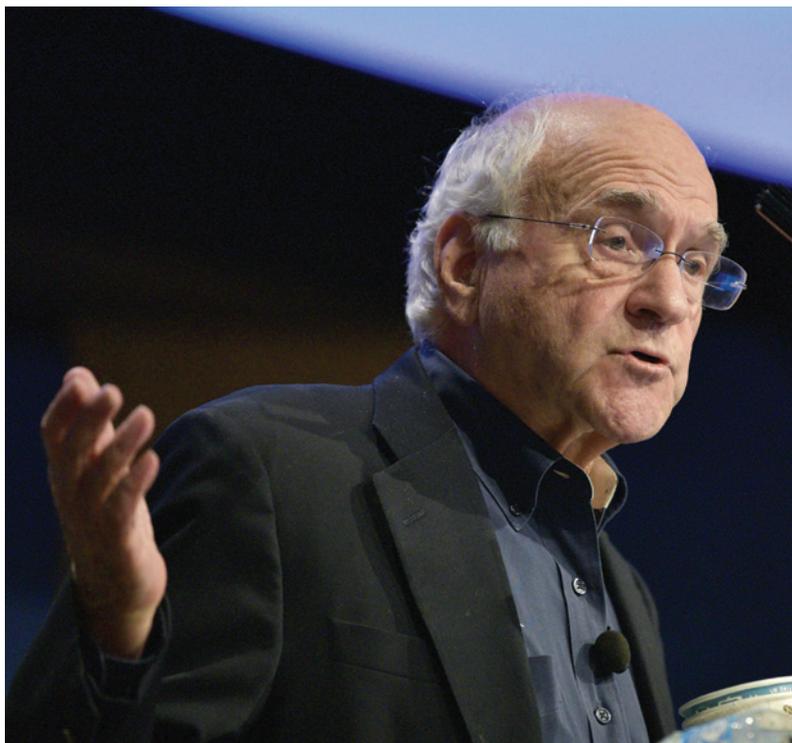
TAKING FLIGHT — Systems engineer Raheel Mahmood (left photo) played a key role in planning the Career Exploration Day with Citizen Schools. He and Adriana Del Cid, community relations intern, led the model airplane demonstration.



IGNITING MINDS — Citizen Schools students learn all about the research done inside the Combustion Research Facility.

Bridging the gap between scientists and politicians

By **Valerie Alba**



OLD FRIEND — Welcoming Vic Reis to the National Security Speaker Series, Paul Cox, executive chief of staff, introduced him as "an old friend of Sandia." Reis recounted highlights of his career spanning more than 50 years in DOE, the Department of Defense and industry. **Photo by Randy Montoya**

Vic Reis, former DOE assistant secretary for Defense Programs, offered a history of U.S. science funding in his recent talk for Sandia's National Security Speaker Series.

Reis outlined his forthcoming book, "Eisenhower, Feynman and the Four Prunes: Strategy, Systems and the Dangerous Science and Technology Elite," an account of the highlights of his career navigating and building trust between the cultures of researchers and policymakers.

Before World War II, he said, scientific research was funded mostly by commercial interests or universities, and the move to government-funded research gave rise to distrust between politicians and scientists.

"You get a situation where Eisenhower is saying, from a policy perspective, don't trust the scientists. From the scientific perspective, Feynman was saying don't trust the politicians," Reis said.

"I found myself in my career for the most part in the middle of that, at the juncture between science and policy, and the approach I've taken is to use systems analysis as a way of bridging that gap to maintain the trust between the political people and the science people," he said.

The "four prunes" are a reference to John H. Trattner's "The Prune Book: The 60 Toughest Science and Technology Jobs in Washington." Reis said he held four of those during his career: working in the Office of Science and Technology Policy; director of the Defense Advanced Research Projects Agency; DoD director for research and engineering; and, at DOE, as the original sponsor and architect of the Stockpile Stewardship Program. [f](#)

Improving hypersonic flight predictions

CONTINUED FROM PAGE 1

Simply put, being able to characterize and predict these pressure spots leads to better vehicle design.

“The understanding of unsteady pressure fields is extremely important for modeling of hypersonic flight vehicle applications for a variety of national security programs,” said Basil Hassan, senior manager.

“This advanced diagnostic development work forms unique datasets for fundamental discovery and model validation at Sandia and has been used to improve flight predictions for several national hypersonic flight programs,” Basil said.

Over the past several years, Katya’s experiments have progressed from the use of miniature electronic sensors to advanced imaging techniques with pressure-sensitive paint, which is applied to a model tested in a wind tunnel and viewed by specialized cameras to measure the pressure fluctuations optically.

The American Institute of Aeronautics and Astronautics recently cited Katya’s breakthrough in characterizing hypersonic turbulent spots and her work with novel fluctuating pressure instrumentation when announcing earlier this year she had won the organization’s Lawrence Sperry Award, given for notable contributions in the field by a person age 35 or younger.

Katya’s experiments characterizing hypersonic turbulent spots used innovative diagnostic techniques to provide insight into the interaction between pressure fluctuations and vehicle structural response.

With advanced imaging techniques and high-speed sensors, the work showed that transitional pressure fluctuations are generated by intermittent turbulent spots that pass by in a millisecond. As the spots grow, they merge into a fully turbulent layer. The data Katya captured was instrumental in improving predictive computer simulations developed by her colleagues at Sandia.

Using a cone-shaped model with an integrated thin panel embedded with pressure sensors and accelerometers at Sandia’s hypersonic wind tunnel, Katya studied the response, or vibration, to turbulent spots.

When the frequency of the passing turbulent spots matched the natural structural frequency of the panel, strong resonance was generated with vibration levels more than 200 times larger than when the spots were mismatched to the panel, she said. “This would be a worst-case scenario for the flight.” Now engineers have an improved means of predicting such a scenario and adapting to it.

A lot of Katya’s work occurs at Sandia’s wind tunnels, but it doesn’t stop there. Last year, she migrated similar pressure diagnostics to Sandia’s blast tube to demonstrate in larger field tests the pressure-sensitive paint technique first used in the wind tunnels. Katya combined intricate lighting, high-speed cameras and the carefully formulated chemistry of pressure-sensitive paint to capture the effect of a shock wave rolling across a vehicle.

Like the turbulent spots in the wind tunnel, the shock wave creates unsteady pressure loading that can vibrate a flight vehicle.

With an explosive charge detonated at one end of the 6-foot diameter blast tube, a shock wave travels through the tube before hitting a model

at the other end. Traditionally, hundreds of small pressure sensors would be placed on the model to measure the force. Instead, Katya proposed using pressure-sensitive paint.

“With sensors, you can only get pressure readings at the discrete locations of where they’re placed,” Katya said. “With the paint you can get data everywhere.”

In August, the paint was airbrushed on a model nose cone. Four high-powered, water-cooled ultraviolet lights were shone on the pressure-sensitive paint, causing it to fluoresce. The more oxygen the paint is exposed to, the less it fluoresces. The greater the pressure, the greater the oxygen. So as the shock wave from the blast passed over the model, increasing pressure on its surface, the intensity of the paint’s glow decreased.

Caught on a high-speed camera shooting at 25 kilohertz (or 25,000 cycles per second) with a filter used to block the ultraviolet lighting, the result is a dark shadow growing over the model from the tip to the base; and then as a reflected shock passes by, the shadow encroaches from base to tip.

The change in the paint’s fluorescence can be calibrated to the amount of pressure exerted on the model.

Katya and her team conducted eight blast tube runs over two days and learned a few valuable lessons from the first-of-their-kind tests. For example, the tests collect better data when it’s dark, or at least cloudy, as sunlight interferes with the paint’s fluorescence.

“It’s a new approach for measuring pressure taken to the blast tube,” she said. “Overall, the tests were successful, and with a few adjustments should ultimately be useful in determining how to protect objects from shock waves.” 



Photo by Randy Montoya

National Day of Prayer

A large gathering from Sandia and Kirtland Air Force Base (top photo) celebrated the 2019 National Day of Prayer May 2. Lt. Col. Jeff Granger, Kirtland wing chaplain (bottom photo), led attendees at the Steve Schiff Auditorium in prayers, along with Cindy Fulcher, N.M. State Police Deputy Chief Jose “Nic” Aragon and David Eiffert, pastor of the Believers’ Center of Albuquerque. God’s House of Praise choir and the Sandia Singers provided music for the event. Other speakers included Jeff Martin and John Clymo, associate Labs director for Infrastructure Operations. The event theme this year was “Love one another, as I have loved you.” Sponsors were Sandia’s Christians in the Workplace Networking Group and the Kirtland Air Force Base Chaplain Corps. Information about the Sandia group is available at cwng.sandia.gov. 



Photo by Lonnie Anderson

Experiments at Z Machine earn Gomez research honors



EARLY ACHIEVER — Matt Gomez, winner of IEEE's Early Career Achievement Award for his experimental work, leans on a laser triggered spark gap switch that generates short current pulses at the Z Machine. **Photo by Randy Montoya**

By **Neal Singer**

Sandia physicist Matthew Gomez has been awarded the 2019 Institute of Electrical and Electronics Engineers' Nuclear and Plasma Sciences Society Early Achievement Award.

Only one scientist in the world receives the award each year. The award recognizes excellence in technical contributions to the fields of nuclear and plasma science that take place during the first 10 years after the honoree completes their degree.

An experimental high-energy density physicist, Matt holds a doctorate in nuclear engineering and radiological sciences from the University of Michigan.

Matt was honored for contributions to magnetically-driven high-energy-density physics, and for leadership in the experimental demonstration of a magneto-inertial fusion concept with the possibility of scaling to ignition.

He has led more than 90 experiments on the Z facility and published not only about plasma formation in the high-current power feed on Z, but also about the first experimental results of the Magnetized Liner Inertial Fusion concept. His publication on the first MagLIF experiments has received more than 130 citations in the last four years, and he has given 11 invited talks on MagLIF during roughly the same time span.

Other Sandians who have won the award in the last decade include Dave Ampleford and Brent Jones. [f](#)

Neuromorphic computing

CONTINUED FROM PAGE 1

This work, published last month in *Science*, introduces a novel approach to parallel programming of an ionic floating-gate memory array, which allows processing of large amounts of information simultaneously in a single operation. The research is inspired by the human brain, where neurons and synapses are connected in a dense matrix and where information is processed and stored at the same location.

Sandia researchers used parallel computing to demonstrate how to adjust the strength of the synaptic connections in the array so that computers can learn and process information at the point it is sensed without transferring it to the cloud. This greatly improves speed and efficiency and reduces power use.

Through machine learning technology, mainstream digital applications can recognize and understand complex patterns in data. For example, virtual assistants such as Amazon's Alexa or

Apple's Siri sort through large streams of data to understand voice commands and improve over time.

With the dramatic recent expansion of machine learning algorithms, applications now demand much more data storage and power to complete these difficult tasks. Traditional digital computing architecture isn't designed or optimized for artificial neural networks that are essential to machine learning.

To further compound the problem, conventional semiconductor fabrication technology has reached its physical limits. Chips simply cannot be shrunk further to meet the demand for energy efficiency.

With conventional computer chips, information is stored in memory with high precision but has to be shuttled through a bus to a processor to execute tasks, causing delays and excess energy consumption.

"With the ability to update all of the data in a task simultaneously in a single operation, our work offers unmistakable performance and power advantages," said Sandia researcher Elliot Fuller. "This is projected to improve machine learning while using a fraction of the power of a standard

processor and 10 times higher speed than the best digital computers."

The work demonstrates the fast speeds, high endurance and low voltage critical for low-energy computing, which are becoming more important in such applications as driverless cars, wearable devices and automated assistant technology. As society increasingly relies on these applications for health and safety functions, improved accuracy and speed without reliance on cloud computing becomes critical.

The technology introduces a novel redox transistor approach into conventional silicon processing. The redox transistor — a device that functions like a tiny rechargeable battery — relies upon polymers that use ions to store information, not just electrons as with conventional silicon-based computers.

Future Sandia research will focus on understanding the fundamental mechanisms that govern how redox transistor devices operate, with the goal of making them more reliable, faster and easier to combine with digital electronics. Researchers are also interested in demonstrating larger, more complex circuits based on the technology. [f](#)

Army Lab geophysicist details shifting Alaska climate

Story and Photo by **Neal Singer**

A federal geophysicist told a Sandia audience last month that understanding rapidly changing Arctic weather conditions is vital to understanding the global climate.

“We can’t ignore Alaska. It’s not just their problem; it’s ours,” said Martin O. Jeffries.

Jeffries is acting technical director and research physical scientist at the U.S. Army Cold Regions Research and Engineering Laboratory. His talk was titled “Understanding and Predicting the Rapidly Changing Arctic: The Need for Enhanced Collaboration in Research.”

Among problems he discussed was the dramatically named polar vortex, credited with bringing wildly cold temperatures to the Midwest.

“The polar vortex has gotten the attention of many people over recent years,” Jeffries said. “It happens because the jet stream is weakening and doing more meandering. That’s because the Arctic is warming more quickly, which breaks down temperature differences” between Alaska and the lower

48 states. “There have always been outbreaks [of extreme cold] but now they are happening more frequently and in longer duration.”

Jeffries, former executive director of the Interagency Arctic Research Policy Committee and past member of the White House Office of Science and Technology Policy, delivered his low-key insights with a calm demeanor that lent additional emphasis to his analysis.

“Not only has cold air reached south, but warm moist air gets up into Alaska, which leads to more rain in winter, creating thinner ice that changes the earth’s energy balance,” he said. “The ice has become much ‘younger,’ a proxy term for thinner.”

The ice, which breaks up more easily, leads to a dark ocean that absorbs energy and warms, rather than an iced-over ocean that reflects incoming energy upward. The thin ice also is weaker in restraining waves from crashing onto the coast where Native Alaskans live.

Jeffries left the changing face of nature to mention a commercial fact that has promoted collaborations among scientists: “A bright spot,” he said unexpectedly, “are lower-cost air fares.”

Increasing interest in the changing Arctic also has led to widely attended ministerial-level meetings to discuss Arctic-area problems and their larger implications. The sessions took place in 2016 and 2018 in the U.S. and Germany, respectively, with a third to be hosted by Iceland in Japan in 2020.

Jeffries’ talk, held in a small Sandia lecture hall, attracted an audience of about two dozen, with 50 more watching online. The talk was sponsored by Sandia’s Earth Science Research Foundation Speaker Series.

The next scheduled speaker in the series is U.S. Arctic Research Commission chair Fran Ulmer on May 23 at the Steve Schiff Auditorium. [f](#)



COLD COMFORT — Martin Jeffries, acting technical director of the U.S. Army Cold Regions Research and Engineering Laboratory, recounted changes in the Arctic climate to a Sandia audience during a talk last month.

Heroux is SIAM fellow

By **Neal Singer**



Michael Heroux

Michael Heroux, senior scientist at Sandia’s Center for Computing Research, has been selected as a fellow of the Society for Industrial and Applied Mathematics.

The SIAM Fellows Program, which recognizes members who have

made outstanding

contributions to their fields, honored Mike for research, leadership and building community in software and algorithms for scientific and high-performance computing.

Mike leads the Trinos scientific software project for Sandia, which collects open-source software libraries, called packages, used as building blocks for the development of scientific applications.

He is also the director of software technology for the DOE’s Exascale Computing Project, overseeing efforts to provide key elements of the software stack for the next generation of leadership computing platforms.

SIAM’s goal is to convey useful mathematical knowledge to professionals who could implement mathematical theory for practical, industrial or scientific use. The international organization has more than 14,000 individual members and about 500 institutional members. [f](#)

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MISCELLANEOUS

TRUNDLE BED, sturdy solid metal frame, w/both mattresses (1 memory foam), great condition, text for photos, \$250. Keller, 505-917-7591.

'BEAUTIFUL' TICKETS, Popejoy, Sunday, June 16, ORC D 112-113; face value, \$88 ea. Smart, 505-363-3956.

PIANO, Baldwin Acrosonic model 2054, pecan, pristine condition, \$1,250. Skocypce, 822-1046.

LOVESEAT, leather; leaded glass/wood end & coffee tables; wood twin bed headboard, frame, mattress, box spring, 1 yr. old; \$500. Manzanera, 505-385-6265.

NEW MEXICORDS BARBERSHOP SPRING SHOW, Great American Songbook, May 17-18, call for showtimes/location. Taylor, 242-4451.

PATIO SOFA, 70" x 20", black wrought iron, w/pil-lows. Drebing, 293-3335.

HYDRAULIC MEDICAL LIFT, dual arm, plug-in or battery, w/foot & knee rests, 2 harnesses (med. & large), \$3,000 new, asking \$1,700. Mabray, explorerabq@gmail.com.

BOWFLEX M5 MAX TRAINER, purchased new in 2016, used occasionally, bonus new frame assembly, \$900 both; Bowflex TC10 tread climber & machine mat, \$650. Shaw, 505-401-7420.

'10 JOHN DEERE X300R, riding mower tractor, 340 hrs., w/wagon, grass collector, cover, rear collect kit, works, \$2,200. O'Grady, 720-587-9857.

OEM SUBARU WHEELS, w/tires, for 300, tires in good shape, wheels have some scratches. Cervantes, 505-453-3304.

DINING ROOM TABLE, square, oak, w/6 chairs, center leaf comes out, creates rectangle table, call for photos. Flores, 505-681-7081.

CHILDREN'S CHANDE-LIER, \$75; living/dining room chandeliers (2), \$75 ea.; gender neutral & girl's clothes, 6-mo.-3T; toddler mattress, \$50. Walraven, 505-288-2942.

COFFEE TABLE, cherry, Amish Connection, \$400; square end table, \$300; oval end table, \$250; all 3 hand-made, Queen Anne-style; queen sofa sleeper, like new mattress, \$500; La-Z-Boy furniture. Pacheco, 948-9407.

DINING TABLE, Thomasville, wood, w/4 chairs, \$600; Thomasville bedroom set, queen bed, beautiful, \$1,200 OBO. Hill, 505-610-2436.

BIKE SPOKE REFLEC-TORS, 36 pcs., 360-degree reflection, enhanced visibility, Crivit Sports, Germany, unopened box, \$6. Wagner, 505-504-8783.

TRANSPORTATION

'89 JEEP WRANGLER, 6-cyl., 5-spd., lift, all-terrain tires, winch, LEDs, etc. 86K miles. Julian, 249-0217.

'00 FORD MUSTANG GT, V8, 4.6L, \$4,800 OBO. St. John, 505-977-1198.

'13 HONDA CRV LX SUV, 4WD, sole owner, well maintained, 56,750 miles, excellent condition, \$15,000 OBO. Rembetski, 512-422-6221.

'17 TOYOTA TACOMA SPORT, 4x4, long bed, 21K miles, excellent condition, \$32,000. Gonzalez, 505-480-4889.

RECREATION

'98 HONDA VALKYRIE, new tires, carbs, plugs, <39K miles, \$5,495. Claunch, scottclaunch@msn.com.

'87 SEA RAY BOAT, 27-ft., twin V6 Merc I/O, galley, dinette & head, tri-axel trailer, many features, call for details, \$12,000. Carr, 505-401-2430.

'13 JAYCO FEATHER-WEIGHT HYBRID CAMPER, lots of additional features, excellent condition, \$13,000. Eckstein, seemec911@gmail.com.

'77 DODGE CLASS C RV, Hunter's Special, 22-ft., 63K miles, good condition, \$3,200 OBO. Willis, 505-304-5034, ask for Doris.

REAL ESTATE

1-BDR. CONDO, modern, newly renovated, private covered parking, upstairs unit, pool, listed on Zillow, \$94,900. Goodson, 505-407-1688.

3-BDR. HOME, 2 baths, 2-car garage, built in '08, new paint, Los Lunas, https://www.zillow.com/homes/for_sale/103743260_zpid/34. Tempel, 563-559-6020.

WANTED

TWIN BED FRAME, twin box for mattress. Gallegos, 505-238-6522.

CHEST FREEZER, does not need to be working, for donation to Cabezon Wounded Warrior Haven. Tachias, 505-480-4836.

HOME TO RENT, married couple, in East Mountains, no pets, 3-bdr., 2 baths, ≥ 1,500-sq. ft., 2-car garage, references available. Maierhafer, 865-292-1722.

VOLUNTEERS, Fabulous Felines charity, for our work with cats. Stubblefield, 263-3468, fabulousfelines@comcast.net.

Mileposts

New Mexico photos by Michelle Fleming
California photos by Randy Wong



Ron Anderson 35



Glenn Rackley 35



Doretta Liyai 30



Mark Martin 30



Steve Silva 30



Chrissy Casias 25



Annette Kitajima 25



Analisa Martinez 25



Dennis Carlson 20



Monico Lucero 20



Tracy Sanchez 20



Rose Torres 20



Aaron Brundage 15



Dave Clovis 15



Shawn Colborg 15



Sean Harris 15



Tommy Mulville 15



Robin Reynolds 15



Nasser Salim 15



Will Vigil 15



Ryan Wixom 15



Esteban Yepez 15



Donald Zerwekh 15

Recent Retirees

New Mexico photos by Michelle Fleming
California photos by Randy Wong



Sam Holmes 42



Jon Bryan 38



Pamela Puissant 38



Chuck Townsend 37



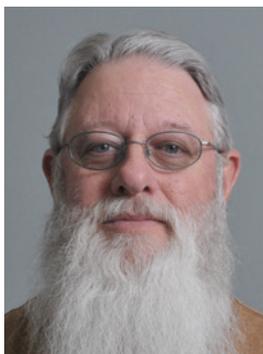
John Henfling 36



Charles Brusseau 35



Roger Ten Clay 35



Michael Gilbert 33



Donna Filip 32



Jessie Black 17



Jerry Mills 15

Retiring and not seen in the Lab News pictures: Jane Hillman, 16 years.

Eubank Gate Security Improvement Project

Scheduled to start 2019

Download the KAFB App!

- 01 Try out a different route and gate
- 02 Catch a carpool, vanpool, or ride to work with a friend
- 03 Determine what alternative commute works for you

Training to defend



Photos By **Randy Montoya**

Sandia's Security Police Officers go through intense weapons training annually to protect members of the workforce from any possible threat, and that training recently took place at Sandia. The officers follow up the multi-day training program by going through weapons qualification six months later. "It is critical that each officer has the skills and confidence to react instantly to any threat Sandians face," said Captain Pablo Montoya, a 34-year veteran of the force. "Our training is rigorous and so is the qualification. That is strengthened with active shooter drills and classroom training." This is the 69th year of operation for Sandia's protective force. 



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