Digital in-line holography helping answer questions about burning fuels

By Sue Major Holmes

Transportation accidents, such as trucks crashing on a highway or rockets failing on a launch pad, can create catastrophic fires. It's important to know how burning droplets of fuel are generated and behave in those extreme cases, so Sandia researchers have developed 3-D measurement techniques based on digital in-line holography.

Digital in-line holography, known as DIH, is a laser-based technique that has been around since the 1990s. Sandia advanced the technique with new algorithms to mine critical information from recorded holograms and new applications in tough fire environments, says Dan Guildenbecher (1512).

“We live in a 3-D world, and, if you think of traditional imaging, it's 2-D,” he says. “This technique is one of the few that can give you a 3-D measurement of a flow.” DIH passes a laser through a particle field. The interaction between the laser and the particles creates diffraction patterns, which a camera records. Researchers

(Continued on page 5)

Lab to market

Twistact wind power technology tapped to continue on the road to commercialization

By Nancy Salem

A helping hand was extended by the Livermore Valley Site’s LabCorps program to the Sandia researchers who would like to commercialize a technology designed to bring more wind energy to the grid.

Twistact and its principal investigator (PI) Jeff Koplow (8366) were chosen for the DOE entrepreneurship pilot program along with Lawrence Livermore National Laboratory’s (LLNL) Optimization of Building Efficiency and its PI Yining Qin.

Jeff and Qin each will receive $75,000 to develop commercialization plans for the technologies. The two project teams made up of the principal investigator, an entrepreneurial lead, and industry adviser, will attend LabCorps business training later this year. The teams also will have access to a suite of commercialization resources,
That's that

I mentioned here not long ago that I was about to mark my 20th anniversary at Sandia. I’d like to follow up by reporting that my colleagues sprang a surprise celebration for me. I was able to sit back and hear some very nice things said about my contributions to the team and to the Labs over the course of two decades. It was a gratifying moment and despite the inside joke that I was due to retire in a couple of weeks, enervating and vanity did get a nice stroking that day. I almost sounded like the proverbial indispensable man.

So far, I have been able to remove a sling I’d been wearing 24/7 for six weeks — my wife and I took a couple of health issues slammed me at the end of that vacation. To celebrate a milestone in my ongoing recovery from shoulder surgery — I was able to remove a sling — and probably a host of other things, too — I ask you to consider how ready to move to the next stage of your life.

Over the years, the tinkerers have played with the height of the pitcher’s mound, nixed the woodworking and done other things on the margins of the game that have aimed to find the magic balance in that existential struggle between the batter and the pitcher. The litany of grievances goes on: Those who would tamper with the game created the designated hitter rule and even introduced limited video replay to second-guess umpires’ on-field calls. The worst idea yet, though, is the introduction in the minor leagues this year of the pitch clock, purportedly to “speed up the game.” But part of the appeal, part of the beauty of baseball, it that it was not, like other contests, constrained by the element of time. The old coach, his mouth wadded with tobacco, could always settle down the green rookie, uttering baseball’s sweetest words: “Relax kid, you got all the time in the world.” Not anymore. Oh well, they say everything changes, and I guess that even includes baseball.

I don’t want to get into the TMI — too much information — syndrome here, so I’ll just say this in keeping with this award: “I’m doing fine now but there was a stretch there where I was deeply frustrated, not just because I was ill and not getting better as fast as I’d like, but also by the fact that I was not able to get back to work.

The obvious take-away from this experience is that the work goes on with you or without you. In my case, the team of which I’m very lucky to be a part stepped up to make sure that tickets were punched, deadlines met, and obligations fulfilled.

It’s no great insight to recognize that you are not, after all, indispensable. Here’s the more important lesson for me: I found out how grateful I am to be able to come to work every morning by my own account. If you ever get to thinking you’ve had enough and would just like to hang it up — and we’ve all had those days, haven’t we? — I ask you to consider how you’d feel if the decision were taken out of your hands, if no matter how much you wanted to get back to work you just couldn’t do it. That’s when you come to understand that work is a gift, one you have to accept with all its ups and downs. It may not be the key, by your own choice — you’re ready to move to the next stage of your life. Of course, working at Sandia gives all of us a big advantage in this regard.

I’m deeply frustrated, not just because I was ill and not getting better as fast as I’d like, but also by the fact that I was not able to get back to work.

See you next time.

— Bill Murphy (MS 1468, 505-845-0845, wmurphy@sandia.gov)

Sandia National Laboratories
http://www.sandia.gov/LabNews

UNM Anderson School honors Sandian

By Rebecca Brock

Fabian Aragon (10997) was honored with the Young Alumni Award from University of New Mexico’s Anderson School of Management April 7 at the 26th Annual UNM Anderson Hall of Fame Awards Banquet and Fundraising Gala.

The Young Alumni Award recognizes professionals under age 40 who have demonstrated outstanding achievement in professional success, contributions to the community, and involvement in continuing education.

Fabian has shown commitment to student outreach through coaching at Sandia. Honoring the Las Vegas native, UNM’s Anderson School cites, “Through his job fabian serves as a resource and mentor to students with the necessary business skills to succeed. He also serves in various capacities to guide students through their career development, professional development and helping them reach their career aspirations.”

Fabian has been a significant part of the Business Community’s student engagement for the past three years. He has helped and hired 70 year-round business interns in the last three years. Additionally, he has spearheaded the growth of the Div. 9000 recruiting program.

As the manager of CIO & IT Business Operations, Fabian oversees a budget of more than $250 million and a staff of 24. Two members of his staff nominated him for the UNM award. He provides financial and business operations to Div. 9000 and Center 8900, delivering the management of service centers, projects, purchasing, and management assurance. His varied accomplishments at Sandia include improvements to the Labs-wide cost efficiencies program and leading the P-Card program to enable mission partners to buy what they need in an efficient manner.

He earned his bachelor’s in accounting from UNM in 2001 and his master’s in management from UNM in 2006. At Anderson he was the founding treasurer of the student chapter of the Association of Latino Professionals in Finance and Accounting.

“This award means a lot to me, because I had the privilege to go to UNM with some folks who are doing great things at Sandia and in the community,” Fabian says. “There are a lot of outstanding graduates from UNM and the Anderson School who work at Sandia, so I am quite fortunate to be honored with this award.”

— Fabian Aragon

Sandia National Laboratories

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).

**Dahwey Chu (1718), Lisa L. Holmes (1750), Thomas Guirret (1753), Randolph R. Kay (1753), Darwin Serkeland (1766), David Y. Campbell(1767), Serathbhal S. Mani (5771), Jeffrey L. Riemstra (5771), and Subhash S. Shinde (6123): Focal Plane Array with a Modular Pixel Array Linear Bit Plane and the Focal-Field can be used for any number of applications.**

Patent No. 8,907,439.

F. Patrick Doty (8126), Patrick L. Ferg (8126), and Jeffrey L. Rienstra (5771): Materials, Methods and Devices to Detect and Quantify Water Vapor Concentrations in an Atmosphere. Patent No. 8,904,850.

Mark S. Derzon (1719), Paul C. Galambos (1719), and Ronald F. Renzi (8625): Ion Chamber Based Neutron Detectors. Patent No. 8,912,502.


Alex L. Robinson (2632) and Mark D. Allendorf (8300): Ion Chamber Based Neutron Detection of an Active Enzymatic Agent. Patent No. 8,853,651.


William C. Sweatt (1513), Michael R. Descur (1725), Robert J. Smiley (1728), Brian J. Cahee (1815), Shawn M. Dirk (2735), and David R. Wheeler (5964): Method to Create Gradient Index in a Polymer. Patent No. 8,859,190.

Lab News Reader Service

The Sandia Lab News Reader Service is in-house to all Sandia employees and on-site contractors and mailed to all Sandia retirees. It is also mailed to individuals in industry, government, academic, nonprofit organizations, media, and private life who request it.


Erik Brubaker (8127), Scott Kiff (8127), and Peter Marusic (8127): Thin film multilayered devices. Patent No. 8,866,100.


Anup K. Singh (8620) and Arnon Hatch (8621): Methods, Microfluidic Devices and Systems for Detection of an Active Enzymatic Agent. Patent No. 8,871,496.


Alex L. Robinson (2632) and Mark D. Allendorf (8300): Ion Chamber Based Neutron Detection of an Active Enzymatic Agent. Patent No. 8,853,651.


William C. Sweatt (1513), Michael R. Descur (1725), Robert J. Smiley (1728), Brian J. Cahee (1815), Shawn M. Dirk (2735), and David R. Wheeler (5964): Method to Create Gradient Index in a Polymer. Patent No. 8,859,190.

— Sandia Lab News Reader Service
Sandia researchers volunteer to support girls’ interest in math and science

By Jessica Scully

A

lthough Lucinda Andrade and Evelyn Jones both attended the Tri-Valley conference, it was the third time Lucinda volunteered to help girls work through computer science-related challenges. The Tri-Valley conference, which was started 30 years ago by a group of women scientists and educators, is an annual one-day event that provides 6th- to 12th-grade girls with hands-on workshops to nurture their interest in science, technology, engineering, and math (STEM).

Lucinda has been volunteering in Expanding Your Horizons (EYH) since she was a graduate student at the University of Illinois at Urbana-Champaign. Sometimes girls don’t view engineering or women engineers as cool and fun,” says Lucinda. “I try to do my best in changing that image.”

Stacy and Kevin have given their workshop at three Tri-Valley conferences and plan to lead it at several upcoming EYH conferences.

“As a female, I think it’s very important that we encourage young women to pursue STEM fields,” says Stacy. “And this is a fun workshop to teach.”

By Nancy Salem

M

artha Campotti was barely 18 years old when she first interacted with Sandia as part of a business school assignment. She was tested on typing, dictation, and vocabulary, and reported to her class what it was like to go through a job interview. She thought that was the end of it.

She graduated and went to Hawaii on vacation. “My dad called and said someone was looking for me about a job,” she says. “They wanted me to go to work when I got back.

It was Sandia calling, and Martha (8366) signed on as a secretary trainee in the Personnel & Industrial Relations group in August 1974. She met then-8000 VP Tom Cook and thought Sandia would be a good place to work for a few years. That was 40 years ago.

Martha, who was raised in a Navy family of seven children in Dublin and Hayward, California, spent her first 40 years at Sandia in various roles, including project coordinator, project manager, and mechanical engineers Stacy and Kevin Nelson (8259 and 8261, respectively).

Kina began her workshop, “Safe and Sound: Cyberthreats and Countermeasures,” with a Skittles illustration of public key exchanges. She then explained email phishing, targeted spam, and other cybersecurity issues. Finally, she led the girls through a Python game and programming activity so they could learn how spam- mers send mass emails.

Kina says, “People age know how to work technology, but they don’t know all the ramifications.”

In her Tri-Valley workshop, “Look Out! We’re Surrounded by Lego Robotics,” girls worked together to create 100-piece Lego robots and write programs to direct the robots’ movements.

“I want the girls to see that programming is nothing to be intimidated by,” Stacy says. “Everyone knows what Legos are, so it’s a great way to introduce these concepts.”

Girls and parents benefit

Evelyn Andrade and Lucinda Andrade, both 13, and Emily Jones, 15, participated in Stacy and Kevin’s morning workshop. After finishing the assigned three programs, the girls wrote two more.

Emily says the workshop provided “room for creativity and space to focus.” All the people actually want to be here and are willing to work,” she says. Lucinda enjoyed partnering with other girls. “This might be a little bit stereotypical, but girls tend to work together better and communicate better in this subject. Boys want to take over and make it all themselves,” she says.

To help parents support their daughters in math and science, the Tri-Valley EYH conference included an outreach program that covered topics such as college planning and financial aid options.

Martha went to the Combustion Research Facility as an office management assistant in such areas as Energy Systems Engineering & Analysis, Combustion & Industrial Technology, and Thermal Fluid Science & Engineering.

“What I love about Sandia is you can work in so many different areas and learn so much,” says Martha, who has no plans yet to retire. “I love the variety.”

Martha says in her 40 years she has seen Sandia/ California become more diverse in work and in staff. The biggest change has been in technology. “I started on an IBM Selectric. Computers were just beginning to appear in offices,” she says. “In the late ’70s, some people said secretaries didn’t need a computer but I got someone in my department to rig one up for me. It was huge, using ROL2 disk drives, and was not consistent. It was a typing time.

Martha is active at the Labs and in the community. She headed Sandia’s Asian Pacific Leadership Committee for 12 years and is a member of the California Divi- sion Diversity Council and the Diversity & Inclusion Action Team. She worked for 15 years as a coordi- nator on Sandia’s California High School Mathematics Bowl and both the Tri-Valley and San Joaquin County Science Bowls.

Martha went to the 2014 regional Science Bowl in Livermore, California, with her daughter Chloe. Martha, who recently celebrated her 40th work anniversary, is a lifetime Science Bowl volunteer. She’s also involved with the girls’ STEM outreach program Expanding Your Horizons.

Martha and Kevin have given their workshop at three Tri-Valley conferences and plan to lead it at several upcoming EYH conferences.

Erica’s interest in math and science was not gender-specific.

Lucinda says, “I try where I can to change that image.”

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“Female, I think it’s very important that we encouraging young women to pursue STEM fields,” says Stacy. “And this is a fun workshop to teach.”

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Digital holography

(Continued from page 1)

then use computers to solve diffraction integral equations, allowing them to take light recorded at the camera plane and refocus it back to the original planes of the particle locations. That gives the position of particles as they were in 3-D space.

In a propellant fire, large molten aluminum drops form at the burning surface. They’re lofted into the environment and can severely damage anything they fall on. Researchers study this by passing a laser through fire while high-speed cameras record the diffraction patterns. Refocused digital holograms provide a clear picture of the burning particles, allowing by measuring the size and velocity of thousands of such particles, researchers can better understand how the particles are formed and transported to this flow.

Interested in 3-D particle measurements in complex environments

“Fundamental understanding of particle formation and transport is necessary to develop next-generation [computer models that predict this scenario],” Dan says. “Due to the corrosive environment, it’s very difficult to measure these phenomena using traditional instruments. You need to have advanced diagnostics and advanced modeling.”

Sandle’s digital in-line holography method uses nanosecond lasers to freeze the motion of particles and kilohertz imaging to track droplets’ size and velocity. Recording and quantifying all droplets in a 3-D volume—the digital hologram—lets researchers quickly measure thousands of individual drops, allowing for accurate 3-D size and velocity measurements. In addition, measuring particle shape enables them to differentiate spherical from non-spherical drops and other particulates in the flow.

Previous work on particle-field DIH largely focused on measuring spherical particles in controlled environments. However, Sandia needed to measure arbitrarily shaped objects in difficult, real-world environments. So Dan and colleagues developed new data processing algorithms that automatically measure complex particle structures in 3-D space, quantifying their accuracy through laboratory experiments. Validation experiments were instrumental to improving the technique and gave us the confidence to apply the method to a wide range of applications, he says.

“Sandia has a long history of developing ground-breaking imaging for a wide range of applications. For example, recent rapid advances in high-speed digital imaging have enabled 2-D videoframing at frame rates from kilohertz to megahertz. This has greatly increased our ability to resolve complex phenomena in difficult environments, and we set up a shotgun as a simulation of this environment,” Dan says. “In a transportation accident, the breakup of liquid fuel leads to wide dispersion of droplets and large-scale fire. Liquid breakup must be understood to predict the scale and intensity of such fires.”

“By focusing on doing something cutting edge, we discovered applications that no one else had attempted and measured phenomena we never expected,” he says. “I liked that we were able to find so many ways to utilize this exciting technology.”

They also looked at shotgun particles, which Dan says was fun but had a practical purpose. “There’s interest in understanding how particulates behave in exploitive environments, and we set up a shotgun as a simulant for this environment.” Results of the successful demonstration were published in a 2013 paper in Optics Letters.

The team published additional papers in such publications as Applied Optics, Optics Express, and Experiments in Fluids, and presented their work at numerous conferences over the past three years. Dan was invited to give talks at the 2015 Gordon Research Conference on Laser Diagnostics in Combustion in Waterville Valley, N.H., and the 2014 Laser Applications to Chemical, Security, and Environmental Analysis conference in Seattle. Dan and Phillip Reu (1512) of Sandia, along with professor Jun Chen and doctoral student Jian Gao of Purdue University, were awarded the 2014 ASME Fluid Engineering Education Award for Excellence in holographic research. The award recognizes an outstanding original paper resulting directly from analytical or laboratory research.

DIH is a crucial diagnostic tool for a new Laboratory Directed Research and Development (LDRD) project to quantify the breakup of molten components in shock-induced flows. In this environment, changing temperatures and the small size of the particles distort the hologram image. Dan and colleagues will look at potential improvements to DIH methods that could correct those distortions.

Dan became interested in the field when, as a doctoral student, he ran into limitations in commercial diagnostics for studying multiphase flows. When he joined Sandia in 2011, he teamed with researchers working in digital imaging. An Early Career LDRD project and the Weapon System Engineering Assessment Technologies (WSEAT) program funded the development work. Team members included Dan and Philip in collaboration with Chen and Gao.
Twistact wind

(Continued from page 1)

including technology validation and testing, facility access, techno-economic analysis, and other incubation services.

“Our team was delighted to be selected. We worked very hard on our presentation,” Jeff says. “We were highly motivated because the quality of instruction and mentoring provided by LabCorps during the past two months completely exceeded our expectations. It was remarkable. We think that going through this program, which allows innovators to see things through the perspective of customers and end users, will make us better innovators.”

The goal of LabCorps is to accelerate the transfer of innovative clean energy technologies from DOE’s national laboratories into the marketplace. The program aims to better train and empower national lab researchers to successfully transition their discoveries into high-impact, real-world technologies in the private sector.

In a collaboration between Sandia, LLNL, the University of California at Davis Children’s Family Institute for Innovation and Entrepreneurship, and the i-GATE Innovation Hub, a Livermore, California, business incubator. Over the past two months, nine teams of researchers from Sandia and LLNL attended a series of seminars at Davis and i-GATE to prepare for a final pitch on March 31 before the Livermore Valley Site selection committee. One team was selected from each laboratory to continue in the program.

The announcement was made at an April 1 event at i-GATE attended by Rep. Eric Swalwell, D-Calif., Livermore Mayor John Marchand; Sandia Div. 8000 VP Marianne C. Wall; LLNL Director Bill Goldstein; i-GATE executive director Brandon Cardwell; and researchers from Sandia and LLNL.

“Transferring clean energy technologies from the laboratory to the marketplace is difficult but it’s also vitally important that we do so,” Marianne said. “This is a great opportunity for our researchers to receive federal support for their entrepreneurial efforts.”

Goldstein said the program underscores the value of the partnership between Sandia, Livermore, Lawrence Livermore, and i-GATE to successfully commercializing laboratory ideas.

New approach to an old problem

Twistact is designed to take wind energy to the next level. “It can eliminate the need for rare earth magnets in multi-megawatt wind turbines, which is the last major hurdle to proliferation of cost-effective wind power,” Jeff says. “Anticipated rare earth supply disruptions are holding back large-scale investment in wind power.”

Twistact also should allow construction of very large wind turbines to achieve better economies of scale that exist at 10 megawatts and beyond, and reduce the weight of wind turbine housings and, potentially, construction costs.

“Twistact is a new approach to the very old problem of how to transmit electrical power between something that moves and something that doesn’t,” Jeff says. “Think of a moving subway train taking power off a stationary track.”

It is done now with a sliding contact device, a brush or shoe, that rides along a surface. But sliding electrical contacts easily wear out. “Twistact connects an electric circuit between something moving and something stationary or, in the case of a wind turbine, something rotating and something not, without a sliding contact and without electrical arcing.”

The technology could be important for wind turbines because it makes the use of copper and steel instead of rare earth magnets practical in the generation.

“Twistact technology is designed to eliminate the need for high-maintenance components like gear boxes and brush contacts,” Jeff says.

More business potential

Three other Sandia teams participated in LabCorps training and were in the running to move ahead in the program: CodeSeal for Energy Grid Protection and PI John Solis, Seagoing Algae Biofinery and PI Ryan Davis (8624), and Laser-Less Particle Image Velocimetry and PI Ethan Eagle (8626). All of the teams were encouraged to continue to use the i-GATE facility and resources to pursue their business plans.

“LabCorps has given these researchers an opportunity to develop their business and entrepreneurial skills,” said Jim Presley, an investor with Pacific Private Capital who is on the LabCorps Industrial Advisory Board. “From the first interactions to now, I have seen a transformation in the thinking of business concepts. The LabCorps participants will greatly increase the chances of attracting investors to pull the technologies into the commercial world.”

By Patti Koning

Sandia mathematician named 2015 SIAM Fellow

Sandia mathematician Tamara G. Kolda (8966) has been named a Fellow of the Society for Industrial and Applied Mathematics (SIAM). Sandia is one of 31 members selected for fellows status this year and the third Sandia scientist to earn the honor. Bruce Hendrickson (1409) and Pavel Bochev (1442) were named fellows in 2012.

“Being named a SIAM fellow is a tremendous honor,” says Tamara. “This organization means a lot to me, both professionally and personally.”

Selection as a fellow is an honor the society reserves for its most distinguished members. Tamara was recognized “for contributions to numerical algorithms and software in multilinear algebra, optimization, and graph analysis.”

A distinguished member of the technical staff, Tamara has been at Sandia since 1999. Her research interests include multilinear algebra and tensor decompositions, graph models and algorithms, data mining, optimization, nonlinear solvers, parallel computing, and the design of scientific software. Tamara has received several awards, including a Presidential Early Career Award for Scientists and Engineers (2003), an R&D 100 Award (2004), and two best paper prizes (IEEE International Conference on Data Mining 2008 and SIAM International Conference on Data Mining 2013). She is a distinguished member of the Association for Computing Machinery.

Tamara is a twice-elected member of the SIAM Board of Trustees, section editor for the SIAM Journal on Scientific Computing, and a member of the editorial board for the SIAM Journal on Matrix Analysis and Applications. She has previously served on the SIAM Activity Group on CS&E as chair, vice chair and secretary as well as the SIAG on Linear Algebra as secretary.

Tamara and the other members of the 2015 class of SIAM fellows will be honored in August at the International Congress on Industrial and Applied Mathematics in Beijing.

Established in 1952, SIAM is an international community of applied and computational mathematicians, computer scientists, and other scientists and engineers that advances the fields of applied mathematics and computational science. The society publishes books and premier journals and also sponsors a selection of conferences and programs. For more information, visit www.siam.org.
Sandra’s success in life extension programs for a variety of nuclear weapons will allow for future reductions in the US nuclear weapons stockpile, NNSA Deputy Administrator Cook said. The US is pursuing a strategy that will reduce the number of nuclear weapons by a factor of two; the removal of the last megaton-class weapon, the B61 from the stockpile; a reduction of more than 80 percent in the special nuclear materials in the bomb portion of the air leg of the nuclear triad; and a commensurate reduction in overall destructive power. Deputy Laboratories Director and Executive VP for National Security Programs Steve Rottler (0002) said that Sandra’s transition to extending the life of the stockpile began in the 1990s with W87 LEP, the 2000s with the W76 LEP, and continues today with LEPs on the B61 and W98, an alteration on the W88, and a replacement of the arming and fuzing assembly for the Minuteman warheads. “We’re frankly facing a workload and challenges that this laboratory and the complex have not dealt with in almost 30 years,” he said.

Steve spoke about Sandra’s commitment and an general approach to nuclear weapons safety. An important philosophy in our approach to underwriting the safety of nuclear weapons is we do not get involved in estimating the probability that a weapon will be exposed to an accident environment. We assume that in the lifetime of every nuclear weapon in our stockpile it will be exposed to a whole set of abnormal environments,” he said.

To withstand any abnormal environments, the weapons are designed so the components providing electrical energy to set off the weapon will fail long before all the barriers in place to prevent that electrical energy from setting off the weapon would fail, he said. “We do that with very, very high confidence,” Steve added.

The Labs play a “critical role” in “advising the government about the focus necessary to achieve the level of confidence and safety we have in our stockpile today. While we never rest on our laurels, it is a supremely engineered level of confidence,” Sandia President and Labs Director Paul Hommert told the visitors. “It is a legacy, which those of us in this business take deeply seriously, that is embodied in this institution.”

Vice President of Energy, Nonproliferation, and High-Consequence Security Jill Hruby (6000) told the visitors about Sandra’s support for national nuclear security programs, arms control treaties and verification, and international threat reduction.

“We make sure that our weapons are secured in all places and at all times,” she said. Jill discussed a variety of Sandra programs, including work to ensure the safety of nuclear weapons during ground transportation, security perimeter detection systems for nuclear weapons facilities, the development of tools for arms control treaties with monitoring provisions, and efforts to secure weapons grade materials.

Senior manager Pablo Garcia, who organized Sandra’s portion of the visit, said the visit went “extremely well” and visitors left informed about the interface of US nuclear weapons policy and the technical work.

“All of them told me personally that they were very impressed by the event, the capabilities they saw, and most importantly, the dedication to our mission by everybody they met,” he says. Sandia “enjoyed hosting our international visitors and showing them how the Labs’ science and engineering expertise is helping strengthen the nation’s commitment to the Nuclear Nonproliferation Treaty. Our work contributes to preventing nuclear weapon proliferation, enabling a safe, secure, and effective stockpile and promoting the peaceful use of nuclear energy,” Paul says. “The open dialogue with our guests, visits to our Z pulsed-power machine, Thermal Test Complex, Integrated Security Facility, and a viewing of nonproliferation technologies showed our guests Sandia’s ongoing commitment to making the world more secure.”

Story by Heather Clark
Photos by Randy Montoya

Sandia hosts first Nonproliferation Treaty Transparency Visit

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MARY CLARE STODDARD (6831), center, explains Sandia technologies to visitors during a Nonproliferation Treaty Transparency Visit that included a tour of the Technology Training and Demonstration area at Sandia’s Center of Global Security and Cooperation.

NNSA DEPUTY ADMINISTRATOR Don Cook poses in front of the Z machine in 1997 and during his most recent visit last month.

THE VISITORS TOURED several remote sites, including the Thermal Test Complex.
Speaker discusses steps toward an inclusive work culture

By Blythe Clark and Tommy Woodall

Unconscious bias in the workplace is not a topic meant to cast blame, but rather a topic for which we all share responsibility and have the power to change, according to a recent speaker at Sandia.

In her talk, Abigail Stewart presented “Creating an Inclusive Culture at Work.” Stewart is the Sandra Schwartz Tangri Distinguished University Professor of Psychology and Women’s Studies at the University of Michigan (UM) and Director of the UM ADVANCE Program, which aims to create a diverse and inclusive culture at UM.

The event, hosted by the Sandia Women’s Action Network (New Mexico) and the Sandia Women’s Committee (California) kicked off Women’s History Month.

Stewart said biases stem from schemas, or hypotheses people draw upon unconsciously — particularly at the beginning of a relationship. These biases extend beyond majority groups, she says, despite what is often presumed.

“Women have gender schemas just like men, and they have the same content. We often have explicit attitudes that conflict with our schemas. The fact that you have a feminist or anti-racist perspective does not mean you don’t have a gender or race schema like everybody else,” said Stewart. “You do.”

She said that while some schemas help us “trust our gut” in making quick judgments, others can be harmful, particularly in the workplace. Without a more conscious approach, she said, people can unknowingly exclude important information in hiring or promotion decisions simply because it contradicts societal schemas.

She discussed how taking steps to successfully minimize evaluation bias (the unconscious reliance on our schemas when judging for hiring, promotion, or awards) has been a major focus area of ADVANCE. To illustrate the need, Stewart shared results from recent studies in which application packages were created as identical copies, save for one variable.

In one case the variable was gender, which was indicated by adding or omitting “Active in PTA.” In comparison to non-mothers, mothers were less likely to be recommended for hire, offered lower starting salaries, and viewed as less competent and committed to paid work.

In the next case, parental status was indicated by adding or omitting “Karen” or “Brian” for an assistant professorship. “Brian” was preferred 2:1 over “Karen.” Stewart said in the next case, parental status was indicated by weeding as less competent and committed to paid work. However, fathers experienced no disadvantage and were seen as more committed to paid work and offered higher starting salaries than non-fathers.

Recognizing such biases and developing policies and practices to minimize them is key to moving beyond a traditional monoculture with a singular path to success, Stewart said.

Stewart said when the National Science Foundation (NSF) initially funded ADVANCE and its sister programs in 2001, NSF recognized monocultures as “organizational dinosaurs” for doing science.

“We operate in a diverse and pluralistic world,” said Stewart. “Diversity is not only consistent with excellence, but is a pre-condition to excellence.”

Stewart said that underrepresentation, quantified as below a critical mass of 30 percent, can lead to a self-reinforcing cycle where disadvantages continually accumulate — unless the cycle is interrupted.

“It’s not bad actors; it’s a systemic feature. This will produce itself unless we intervene,” Stewart says.

She recommended institutions start by focusing on recruitment practices and policies, where impact can occur quickly, while working on institutional culture in parallel. She also emphasized the importance of mentoring.

“At the beginning, people thought, ‘The good people don’t really need mentoring; they just do it.’ We don’t hear that anymore. Some people get more mentoring ‘accidentally’ or ‘by the way,’ and other people don’t. That’s not fair. You need to ensure that it happens structurally,” Stewart said.

Creating an inclusive culture not only impacts underrepresented groups, but also creates an environment in which everyone thrives, Stewart said. The ADVANCE program’s 2012 survey data showed a marked impact since 2001 on institutional climate, work satisfaction, and intention to stay across all groups, she said, whether in the majority or the minority.

Stewart stressed that success requires continual self-evaluation as an institution as well as full leadership engagement and commitment.

“Cultural change isn’t easy, it’s not fast, but,” she said, “it’s possible.”

Stewart’s presentation is available at http://tiny.sandia.gov/stewart.

IARPA director briefs Sandians

The Intelligence Advanced Research Projects Activity (IARPA) is focused on bringing together the best minds in the nation to address challenging problems for the Intelligence Community. IARPA Director Peter Highnam told a group of Sandians during a presentation April 2. The presentation followed a tour of various Sandia facilities.

“I am working with the Intelligence Community, Highnam said IARPA’s work is extremely focused, with clear, measurable goals, and its projects typically cover a three-to-five year span.

“We use five [Hilzheimer] question sets to frame everything we do,” he said.

“We have it tattooed on us. It’s trickier than it looks to get these questions right.” They include specifics around what the researcher is trying to do, what they will be doing that’s new, and what kind of difference the project could make if it’s successful.

The approach has worked. “We’ve been very successful at predicting real-world events,” he said. “We make sure we get information to people who have to make tough decisions, whether they want to or not.”

Sandia has had associations in the past with IARPA, with staff serving on programs such as their Circuit Analysis Tools (CAT) Program, and the Trusted Integrated Chips (TIC) Program. Several tools from the CAT Program will be placed in the recently occupied Counterfeit Detection Center.

INTELLIGENCE ADVANCED RESEARCH PROJECTS ACTIVITY Director Peter Highnam, left, with Cindy Longenbaugh (5642) and Bradley Gabel (5644) during his tour of Sandia.

Photo by Randy Montoya
Explosive Destruction System begins first stockpile project

By Patti Koning

Last month, the Explosive Destruction System (EDS), designed by Sandia for the US Army, began safely destroying stockpile chemical munitions. The project to destroy 560 chemical munitions at the US Army Pueblo Chemical Depot in Colorado with EDS is a prelude to a much larger operation to destroy the stockpile of 780,000 munitions containing 2,600 tons of mustard agent stored at the Pueblo depot since the 1950s.

The bulk of those munitions will be safely destroyed in the Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP), which will begin operation later this year. The munitions to be destroyed in EDS are considered unsuitable for processing by the plant's automated equipment because they have leaked or have been sampled in the past.

“EDS was originally designed for nonstockpile chemical munitions at recovery sites, many of which are deformed and corroded,” says mechanical engineer Brent Haroldsen (8137), the Sandia project lead. “Stockpile munitions are generally in better shape, but there are always a few that are leaking or damaged. That’s where EDS will come in to keep the plant moving efficiently.”

The Program Executive Office, Assembled Chemical Weapons Alternatives (PEO ACWA) is overseeing the pilot plant as well as the Blue Grass Chemical Agent-Destruction Pilot Plant near Richmond, Kentucky. Once the pilot plant begins operation, the EDS systems will remain at the site to process any additional reject munitions unsuitable for processing in the Pueblo pilot plant.

Latest EDS model destroys munitions twice as fast

The two EDS units that will augment the pilot plant operation work much faster than the original EDS, which took two days to process a single munition. Sandia designed that system for the Army in the late 1990s to destroy munitions that were discovered unexpectedly.

To safely destroy a few damaged munitions at a time, possibly in populated areas, the original design emphasized transportability, flexibility, redundancy, surety of destruction, and simplicity of manual operation — not rapid processing.

The Army first used EDS in 2001 at the Rocky Mountain Arsenal in Colorado and then at other locations where abandoned munitions were recovered. Sandia then created a larger version, capable of destroying multiple munitions simultaneously and handling munitions with a higher explosive charge. In 2010, Sandia engineers created the Phase 2 Pilot (P2P), which decreased the processing time from two days to one through changes to the heating and cooling system and door clamp design. (See the Sept. 7, 2012, issue of Sandia Lab News.)

Over the years, the basic operation of EDS has remained the same. At its core is a leak-tight vessel in which munitions are placed. An explosive shaped charge opens the metal shell, exposing the chemical agent and burster, a small explosive that disperses the agent. The burster explodes or deflagrates safely inside the vessel. A reagent is then pumped into the chamber to neutralize the chemical agent. The chamber is heated and turned to mix the chemicals and speed the reaction.

Stockpile munitions easier to process

The new EDS, called the Phase Two Retrofit (P2R), incorporates many of the P2P improvements along with a separate boiler/chiller container and larger pipes and pumps to transfer fluids more quickly. Working with stockpile munitions also simplifies the explosion process.

“Nonstockpile munitions are discovered in strange conditions, tangled in tree roots or covered with barnacles. Badly corroded munitions are often stabilized with plaster of Paris and then wrapped in plastic before processing. Consequently, the EDS was designed to be adaptable and flexible,” Brent says.

But stockpile munitions, even problematic ones, are quite uniform. “So we need less flexibility in the design and we can use the shaped-charge explosives more effectively to cut the munitions,” says Brent.

At the pilot plant, EDS will process six munitions a day, starting with 560 reject munitions already set aside. ACWA expects EDS to destroy about 1,300 munitions over the five-year operation, including reject munitions.

Improvements under way to vapor monitoring

In collaboration with Defiant Technologies, the EDS team also is working on an in-situ vapor monitoring system, which is an offshoot of Sandia’s MicroChem-Lab gas phase system. To ensure the EDS vessel is safe to open following operation, a vapor sample must be collected and analyzed. An in-situ monitoring system would draw a sample from inside the vessel, eliminating the collection step and saving about 45 minutes. The vapor monitoring system also can monitor for multiple agents simultaneously, so it could be used to monitor the environmental enclosure around EDS or at a munition recovery site. That monitoring is currently being done with specialized gas chromatographs, which are reliable but can only check for one agent at a time.

“The ability to monitor for multiple agents with a single system would further simplify operations,” says Brent.

The two EDS units will spend several years at PCAPP. Meanwhile, the Army continues to use the EDS system to destroy recovered chemical munitions.
Mileposts

New Mexico photos by Michelle Fleming
California photos by Dino Vournas

Moses Jones 35 2557
Larry Trontz 33 155

Stephen Ward 35 3010
Tom Burford 30 2215
Dan Carroll 30 5792
Gordon Roubik 30 5403

Tap Taplin 30 2665
Kyle Thompson 30 1522
J. Anthony Wingate 30 414
Larry Friday 25 2981

Jill Glass 25 2547
Brad Hanke 25 1132
Richard McLendon 25 10600
Carol Meinecke 25 4855

Marty Shaneyfelt 25 1767
Edith Hendrix 20 2720
Darren Holke 20 411
Jennifer Lange 20 10613

Sherry Stone 20 10662
Monica Ton Eyrck 20 2137
Barbara Allison 15 2522
Ruben Baca 15 2633

Darren Branch 15 1714
Rachel Carlson 15 2555
Adrian Chavez 15 5629
Bert Cox 15 3523

Rich Dietrich 15 6813
James Duncan 15 4128
Walter English 15 2155

Retiring and not seen in the Lab News pictures:
Linda Shepard (5562), 17 years.
Kent Beringer 39 6834
Daniel Hardin 38 8230

Judith Jojola 33 10246
Ralph Chapman 32 9542
Michael Irvin 32 6523

Dennis Miller 29 1530
Ellen Cook 25 254
Michael Wilson 25 6921

James Schrader 17 3522
Nora Stoecker 15 249
Jeanne Overall 12 2522

Linda Shepard (5562), 17 years.
**MISCELLANEOUS**

DVD PLAYER, Sony, w/remote, barely used, $20. Hennen, 505-269-6243.

TIRES, 4 LT 235/75R18 Cooper Discovery R/T 3, only 3K miles, new, $250. Fredenburg, 505-348-2448.

APPLIANCES, all Whirlpool, 36 in. side-by-side refrigerator; dishwasher; stove; microwave; crown; a, 5100 firm. Casas, 505-814-4866.

VINTAGE CHAMBER STOVES, 2 energy efficient, continues cooking w/cookoff, w/ 3 burners, deep well, girdle/brol- er. Lovato-Montoya, 342-0403.

ELECTRIC LAWN MOWER, Black & Decker, 15 in.; electric grass clippers, almost new; small area, $100; $40 or $125 for both. Hawkins, 505-341-0314, ask for Rachel.

WICKER FURNITURE, love seat, excellent condition, $300. Palya, 881-2720.


STORAGE CABINET, granite tile-topped storage cabinet, w/20+ pcs. including reversible cushions, used inside 2 chairs, coffee table w/re- versible cushions, used inside 2 chairs, coffee table, $38. Warren, 235-8085, ask for Marty.

COFFEE TABLE, 2 end tables, oak, good condition. 90. Vrooman, 505-249-8414.

SOFA, La-Z-Boy recliner, $850; brown leather recliner, 3 chairs, $450 & $350; $1,350 for all; marble-top tables, $350 & $40; Dining room, 293-3335.

WEIGHT BENCH, w/160-lb. weights, multi-function, Weider Pro, like new, little use, $175 OBO. Orion, 292-4691.

Tvs, 2 DTV converter, micro- scope, Xbox; Trike Sport scooter; Nintendo. Difendore, 610-2374.

CAMPER SHELL, light gray, from '94 Ford 150 58, $400. Schroeder, 505-917-4516.

LAPTOP, Samsung S5.5 Ultra, touchscreen, Windows 8, in- tel processor, like new, $700 OBO. Garcia, 293-2810, ask for Terri.


TUBE AMP, Fender HR Deluxe, 40-W, home studio use, only 10 hrs., $500. Pruitt, 281-5287.

DIGITAL CAMERA, Nikon D300S, DX 18-70 mm lens, new, never used, $38. Schroeder, 505-917-4516.

D300S, DX 18-70 mm lens, new, never used, $38. Schroeder, 505-917-4516.

COUCH/LOVE SEAT, leather, coffee table, dining sets, in en- tertainment center, all ranch-style, prices vary, photos available. Brown, 505-980-6860.


POP-UP TRUCK TOP, benefits Junior League of Abilene, Que- bique, May 2, 8 a.m.-1 p.m., free. Steele, 505-980-8660.

BICYCLE, built for two, $50. Roberts, 505-980-8660.

PIGGY BV 250 SCOOTER, w/trunk & trickle charger, 12K miles, excellent condition, $2,500. Colunb, 640-4915.

PAECE ARROW MO- TORHOME, lots of extras, Battery, 2 kits, 2 slide out condition, $32,900 OBO. Garcia, 505-306-1764.

ELECTRICAL WATER HEATER, 4.0 kw, 37 gpm, used, $300. Gurrieri, 856-1688.


BICYCLE, TOAD COMPETITION, 825 cc, $1,500. Hpry, 505-695-2482.

VACUUM CLEANER, Rainbow.

**RECREATION**

BICYCLE BUILT FOR TWO, Tandemum, call or text, photos available. 249-1931.

'02 KEYSTONE SPRINGDALE TRAVEL TRAILER, 19-ft., AC, heater, shower, tub, toilet, refrigerator, all in ex- cellent working condition, $3,550 OBO. Regis, 505-269-9049.

FLEETWOOD POP-UP CAMPER, 3-way refrigerator, grill, new tires, sleeps 2. $1,999. Smith, 366-4037.

ALLEGRO MOTORHOME, 28-ft., low mileage, new tires, aving, belts, batter- ies, good condition, $10,000. Duncan, 505-306-7614.

KYMCO PEOPLE 250 SCOOTER, w/trunk & trickle charger, 12K miles, well cared for, $1,400 OBO. Verley, 410-9885.

PIAGGIO BV 250 SCOOTER, extra, 7K miles, excellent condition, $2,500. Colunb, 640-4915.

PRESERVE ARROW MO- TORHOME, lots of extras, Battery, 2 kits, 2 slide out condition, $32,900 OBO. Garcia, 505-306-1764.

ELECTRONICS, TVS, 2; DTV converter, micro- scope, $40 OBO. Harvey, 424-1619.

HOST FAMILY, open your heart and home to an International AFS, host w/AFS. Ibeau-Hobbs, 296-1158.

REAL ESTATE

WOMEN'S SMALL/MEDIUM REEL-TO-REEL TAPE DECK, $50. Sais, 296-1158.

REEL-TO-REEL WETSUIT, for surf. Klein, 281-6611.

HOST FAMILY, open your heart and home to an International AFS, host w/AFS. Ibeau-Hobbs, 296-1158.

WANTED

HOST FAMILY, open your heart to an international high school exchange student, host w/AFS. Ibeau-Hobbs, 296-1158.

REPAIR TO REEL TAPE DECK, Pioneer, Tea, Techs & accessories field, 829-8967.

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WOMEN'S SMALL/MEDIUM REEL-TO-REEL WETSUIT, for surf. Klein, 281-6611.

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New building preserves inactive records, earliest weapons designs

By Lindsey Kibler

Sandia has finished building a storage facility that will house more than 35,000 boxes of inactive records.

“The facility includes both historical collections held by the Sandia Corporate Archives and collections that are being maintained until they meet their required records retention period,” says corporate historian Rebecca Ullrich (9532). “Sandia determines the appropriate retention period for both the General Records Schedule provided by National Archive and Records Administration (NARA) and DOE-specific records schedules.”

Albuquerque-based Summit Construction Inc. began the Inactive Records Storage Facility in the summer of 2013 and finished this January — under budget and eight months ahead of schedule.

The consolidation gives Sandia records managers easier access and improves the implementation of records management requirements. “Having everything in one place and organized electronically is a great benefit,” says Susan Kitsch, manager of Recorded Information Management Dept. 9532. “If a scientist or engineer needs to read a researcher’s notes from previous years, we can go to one place to find and retrieve that information. We can look at where it is shelved, quickly access that information, and maintain a proper chain of custody.”

From compliance and historical perspectives, the new facility will ensure corporate archives and federal records are preserved and safeguarded from environmental hazards.

While the bulk of the boxes contain inactive records, there is a lot of material of broader historical interest, too. For example, the notebooks of Willis Whitfield, who invented the laminar-flow cleanroom in 1962, are stored in the facility.

Susan says, “This is our nation’s history and this facility is going to allow us to manage our portfolio of information, preserve it, and protect it.”

The facility was constructed using a “safe by design” method. HVAC systems and other equipment are mounted at ground level, which allows easy access for maintenance. In addition, keeping equipment off the roof prevents damage to the building’s contents by eliminating a potential source of leaks, an NARA specification for records storage facilities. Other features of the 15,000-square-foot facility that meet National Archive and Records Administration requirements include:

- Two-hour-rated fire barrier walls between records storage areas and other auxiliary spaces;
- Sprinklers are needed;
- Fire suppression system constructed in conjunction with stacking systems to mitigate water damage; if sprinklers are needed;
- Continuous climate control (temperature, humidity, and air exchange) and emergency power backup for egress lighting; and
- Egress lighting;

A representative from the NARA visited the building periodically to view progress and ensure Summit and Sandia were meeting records storage specifications. Originally, planners considered building modules offshore and then assembling the records center at its new location but eventually it was built on-site in three phases.

“We were able to construct the building on-site, at a lower cost,” says Matt Cattaneo, who served as the facility project lead and managed project costs. “This, in turn, allowed for creative teaming with Summit Construction and accelerated the second phase of construction, which put the project under budget and ahead of schedule.”

Sandia has finished building a storage facility that

Chief of Naval Operations visits Sandia

DURING A MARCH 25 visit to Sandia, Chief of Naval Operations Adm. Jonathan Greenert toured the Microsystems and Engineering Sciences Applications (MESA) facility and Z machine, and received briefings on a number of topics related to defense. Shown with Adm. Greenert are, from left, Steve Rottler, Deputy Labs Director and Executive VP for National Security Programs; Paul Hommerd, Sandia President and Labs Director; Capt. Michael Shudeman of the US Navy; Gil Herrera, director of Microsystems Science & Technology Center (1700); and researcher Dawn Serkland (1766).