Follow the sun

Sandia solar-tracking technology fuels global business

By Nancy Salem

In the 1980s Tim Leonard was busy programming computers at Sandia, unaware that just down the hall work was going on that would change his life.

Tim was in the wind energy group, steps away from the people in solar energy. One of them was Alex Maish, starting his pet project, a low-cost, high-precision tracking technology to continuously move solar panels into the best possible position to catch sunlight and generate energy.

"I met Alex, but I didn't really know what he was working on," Tim says. "I would visit, say hi, and go back."

Years later, after leaving the Labs, Tim ran into Alex at a local nursery. He filled Alex in on his business — programming and electronic upgrading of gaming machines — and confided that it wasn't challenging.

Alex mentioned his solar-tracking technology. "He said it was being licensed but that none of the interested companies had been able to commercialize it. He needed someone to make some prototype [circuit] boards for an industry client," Tim says. "I told him I'd take a look."

Tim helped Alex with electronics and programming, and liked the technology so much he licensed it himself in the mid-1990s. He built a business, Precision Solar Technologies Corp., and placed trackers around the world. Among Tim's customers is Sandia, where the technology was developed and where many solar devices are fitted with his trackers, including at the National Solar Thermal Test Facility.

"We're now into 16 years of commercial use and thousands of unit-hours of performance," Tim says.

Celestial equations

Alex's goal was to develop affordable precision tracking for solar energy research, development, and production. His technology — trademarked SolarTrak by Sandia, which holds the patent — is a software program in a computer chip that sits on an electronic circuit board that controls the tracker.

Unlike sensor-based controllers, SolarTrak uses celestial equations to calculate the exact position of the sun at any time, anywhere on the planet, regardless of cloud cover. "This can be critical in partly cloudy situations where the bright edge of a cloud can fool a sensor," Tim says.

SolarTrak determines the sun's location, makes deci-

(Continued on page 5)

WEATHERWISE — Tim Leonard, right, owner of Precision Solar Technologies Corp., and the company's project engineer, Tony Louderbough, do final adjustments on the instrumentation of a trailer-mounted solar weather station, called the Prospector Mule, at Sandia Labs. Precision Solar uses a tracking technology developed at Sandia. (Photo by Randy Montoya)

108 Sandians move into Distinguished, Senior ranks

Sandia's special appointments represent employees from all areas of the Labs' operations. This year, 108 Sandians have been honored with special appointments, including Lynne Adams (10223), left, who has been promoted to the distinguished level of her job family. See all the 2012 special appointments on **pages 6-8.**

Sandia LabNews

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Sandia National Laboratories

White House science adviser John Holdren visits Sandia

MICROSYSTEMS S&T and Components Center 1700 Director Gil Herrera, left, discusses his center's work with White House Science Adviser John Holdren during Holdren's June 7 visit to the Labs. (Photo by Lloyd Wilson)

By Neal Singer

US presidential science advisor John Holdren opened his Sandia National Security Speaker Series talk last Thursday in the Bldg. 810 auditorium by thanking Sandians for the work done here, "not just from myself but from President Obama. What you do at Sandia is extremely important for the country in so many different respects."

The first presidential science advisor to visit Sandia (said Sandia President and Labs Director Paul Hommert in his introduction), Holdren holds a resume impressive even among people of high achievement. He is Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy, and Co-Chair of the President's Council of Advisors on Science and Technology (PCAST). He is a member of the National Academy of Sciences and the National Academy of Engineering, and served as

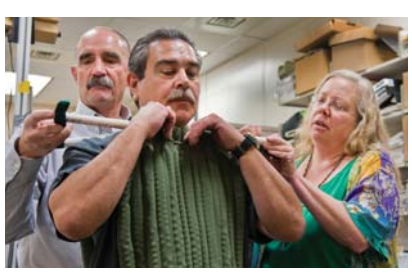
(Continued on page 8)

www.sandia.gov

Sandia launches new website

Sandia has a new home on the range, actually, the Internet. The Labs' redesigned external website, launched June 11, is the first website redesign in more than seven years. The renewed www.sandia.gov establishes a modern, easy-to-use presence for Sandia and is based on nearly two years of user testing, research, and benchmarking by Corporate Web Design and Development Services (8947) and Labs-wide coordination, planning, and direction by Media Relations and Communications (3601). Many, many Sandia and contractor staff brought the idea of a redesign to reality. Among key individuals from Dept. 8947 were Ann Lorenz, technical lead for the project; Ted Anaya, project oversight; Steven Wenrich, site developer; Brian Byers, site designer; and Vivien Lee, content strategist. Tameka Huff (6925) coordinated usability testing. From 3601, Darrick Hurst, with Jennifer Awe, strategic direction, overall integration, and content development. Those who have external web content that should be scheduled for migration to the new site's appearance should contact Darrick or Jennifer. Those with general questions should email them to webco@sandia.gov.

Inside . . .



That's that

Sometimes the stars — and planets — just align in your favor. Mere weeks after the spectacular annular solar eclipse wowed tens of millions of viewers along a globe-spanning path (including us fortuitous folks in Albuquerque), Venus and the sun completed their own rendezvous with destiny. Once again in the period of less than a month, neighbors came out of their homes, held their special eclipse glasses to their eyes, and watched Venus slowly move across the face of the sun, a great kabuki drama played out in the skies above.

For scientists, the transit of Venus offered up a rare hands-on (so to speak) chance to gain insights into how to look for exoplanets. In the centuries since the transit of Venus was first observed scientifically in 1639, scientists have found the event useful in any number of critical calculations.

For laymen, in whose ranks I very much fall, the transit was a fascinating occasion that once again spawned thoughts about the order and scale and purpose of things. How small Venus appeared! And how vast the sun, our star, by comparison.

As seen from Mars, would a transit of Earth look much the same? Would we look so small? We are, after all, a near twin of Venus in size and Mars is roughly the same distance from us as we are from Venus. Arthur C. Clarke, the science and science fiction writer with the restless, endlessly inquisitive mind, wondered the same thing. In his case, he worked it out, as he often did, in a story, *Transit of Earth*. In the story, written in 1971, a team of astronauts is sent to Mars in 1984 to view the transit of Earth. Without getting into any spoilers, I will say that one astronaut does record his impressions of the transit and, in Clarkean fashion, reaches something of an epiphany about his place in the scheme of things. Worth reading.

While Clarke's story is fiction, the dates are real; a transit of Earth did occur in 1984 and the next transit of our planet as seen from Mars will happen in 2084. It's perfectly conceivable that we could have eyewitnesses on the scene by then to record the event. I hope so. It's possible, maybe even likely, that some child now learning his or her multiplication tables in a classroom will be the senior scientist on a mission to observe the transit. (After all, in 2084, 80 will be the new 40). For myself, as much as I'd love to be on hand to see it for myself, I will be perfectly happy to limit myself to Earth-based opportunities. As such, I'll have to stick around until 2117 to see the next transit of Venus. Works for me. You too, I bet.

* * *

Writing about Arthur C. Clarke evokes for me some fond memories of another early pioneer of the sci-fi game, Ray Bradbury, who died June 5 at the age of 91. As a science fiction writer, Bradbury wasn't in the same class as Arthur Clarke, an assessment Bradbury wouldn't dispute. After all, he considered his work to be fantasy, which I think is about right. Call it what you will, with its space-based and futuristic settings, his work surely was a close cousin to science fiction and I ate it up the way some kids devoured comics. When I was a very young reader, I thought I had never read anything so marvelous as *The Illustrated Man*. As I got older, my tastes changed and I left Bradbury behind (but not forgotten), drawn under the spell of writers like Clarke, and Robert Heinlein, and Isaac Asimov. One website refers to that trio as "The Big Three," which is certainly true from my perspective. These three were, for me, like Shakespeare, Hemingway, and Fitzgerald are to a literature major, the fonts of untold wisdom and insights. And mostly, dependable sources of sheer reading entertainment.

Upon his passing, I learned some things about Bradbury that I hadn't known. For example, he never learned to drive a car. Seems a bit eccentric, but then, writers can be that way. Isaac Asimov, who wrote about fantastic flights to the ends of the universe, was afraid of flying and avoided it through most of his long and well-traveled life. For that matter, Ray Bradbury is in some pretty good company with his own aversion to driving. Albert Einstein didn't drive either. Did he know something we don't know? Well, obviously.

* * *

Mind one more little tidbit about Isaac Asimov? I love this quote of his: "The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka!' (I found it!) but '*That's funny...*'

See you next time.

— Bill Murphy (505-845-0845, MS0165, wtmurph@sandia.gov)

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Sandia honors young women for outstanding achievement in math and science

Sandia CaliforniaNews

By Patti Koning

Last month, the Sandia Women's Connection (SWC) honored 18 young women from area high schools for their achievement in math and science. Now in its 21st year, the Math & Science Awards event is designed to both encourage the young women to continue studying math and science and to create mentoring opportunities.

For the second year in a row, the event was held at Sandia's Combustion Research Computation and Visualization (CRCV) building at the Livermore Valley Open Campus (LVOC).

"The world is wide open to you," said Div. 8000 VP Rick Stulen. "It may sound trite, but you will end up in places you can only imagine today. Keep up the enthusiasm and curiosity that got you here today. I can tell you that it only gets better from here. It gets harder, for sure, but it also gets better."

WELL DONE !— Div. 8000 VP Rick Stulen congratulates Britney Johnston, winner of the Outstanding Achievement in Science Award for Manteca's East Union High School. (Photo by Dino Vournas)

Teachers from nine high schools in Livermore, Dublin, Pleasanton, Tracy, and Manteca nominated two students, one for outstanding achievement in math and one for outstanding achievement in science. The award is given to young women in their junior year of high school so they can include it on their college and scholarship applications.

"Although women have made tremendous strides in math and science, there is a lack of women in very high levels of related industries, including engineering, mathematics, and physics," said Cathy Branda (8623), the event's chair. "The decisions that women make not to pursue careers in STEM [science, technology, engineering, and math] fields seem to be made very early. Our objective is to highlight for you that you can aim your sights on any career option and to give you a flavor of what some of those career options could look like."

Before the awards ceremony began, the awardees and their families met their Sandia hosts, women with careers in math and science. Donna Djordjevich (8116) explained her Ground Truth program, an interactive gaming platform used to simulate critical homeland security activities. Yanli Liu (8621) shared her research on the use of a microfluidic device to study cellular signaling at sub-cellular resolution.

"This is really wonderful and encouraging for these girls," says Elizabeth Lopez, a science teacher at Granada High School. "Even today, engineering, math, and science are still considered 'boy' subjects. Meeting all of these successful women reminds them that they can do whatever they set their minds to."

The challenge for Rachel Sowa, winner of the science award for Livermore High School, is narrowing down her interests. She's considering computer science, architecture, civil engineering, and now sound engineering, after running the sound board for her school's spring musical, "Hairspray." "She's always been a builder," says her mother, Genevieve Getman-Sowa. "She's worked hard and it's paying off."

For her father Erik, the awards ceremony was also a return to his roots — he worked at Sandia with Rick Stulen early in his career. "I couldn't be happier for Rachel to be included in this group of young women," he says. "It's important for her to be surrounded by

(Continued on next page)

An ideal companion for biofuels

By Patti Koning

When Aristotle said that the whole is greater than the sum of its parts, he probably wasn't thinking of engines and biofuels. But his famous quote applies perfectly to the synergy between Leaner Lifted-Flame Combustion (LLFC) and oxygenated biofuels. Each technology has its own limitations, but combining the two may create something much greater — a cleaner, more efficient, lower cost diesel engine that runs on domestic, renewable fuels.

Lyle Pickett and Chuck Mueller (both 8362), working in partnership with Ford Motor Co. and the University of Wisconsin's Engine Research Center, are investigating how oxygen-rich biofuels might enable low-emissions diesel engines.

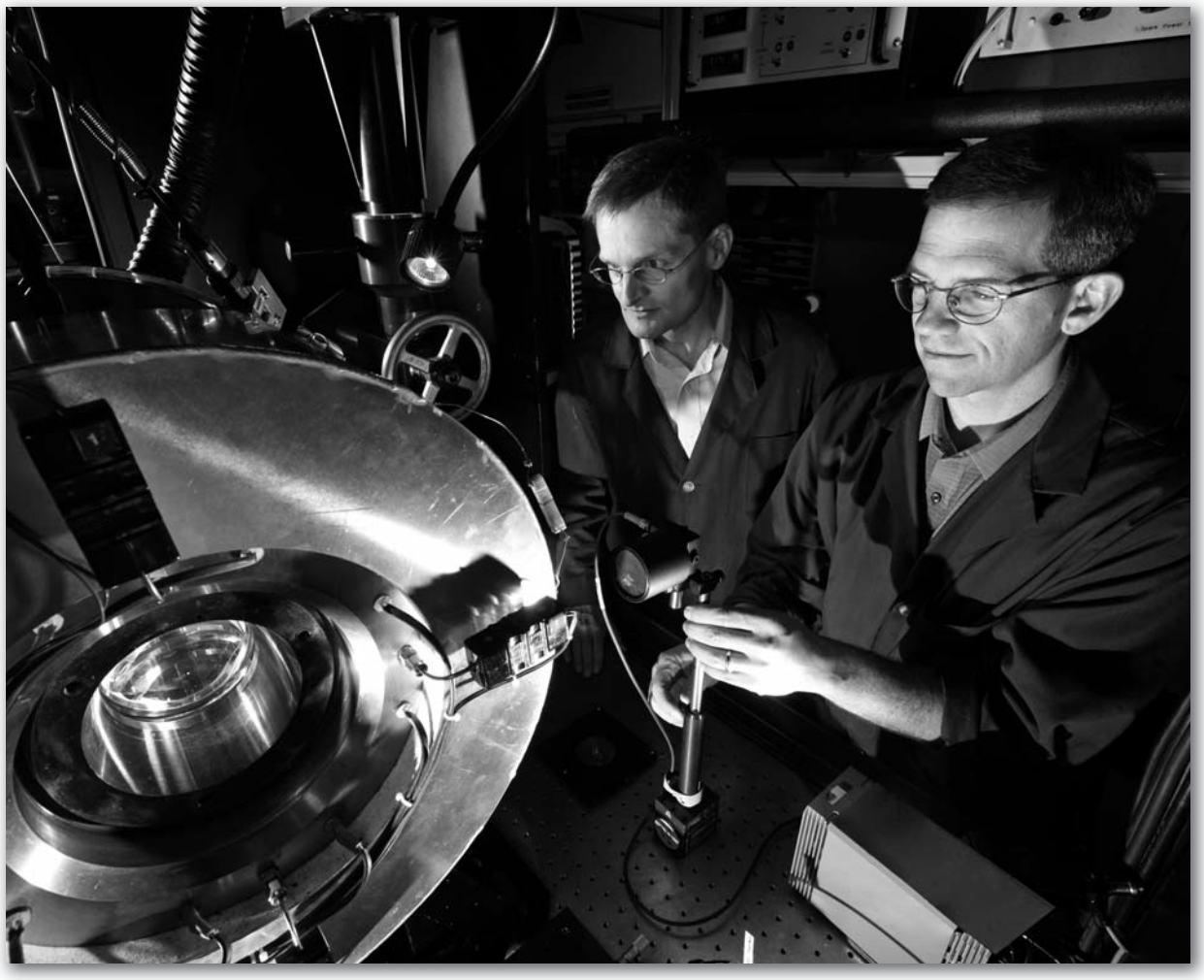
"The cost of advanced engine and aftertreatment technologies can be a barrier to improving fuel economy," says Lyle. "Clean-diesel cars are more fuel efficient than regular gasoline cars but they haven't been adopted widely, in part because they are more expensive. The interplay between LLFC and the right biofuel may produce a high-efficiency combustion strategy that can also reduce costly aftertreatment and overcome that barrier."

An alternative combustion strategy

LLFC is an alternative combustion strategy developed by Sandia with the potential for soot-free emissions. With LLFC, the fuel spray mixes with air inside the cylinder before reaching the flame. The distance from the fuel injector to the flame is the "lift-off length."

"With enough oxygen mixed into the fuel, you go from an orange, soot-producing flame to a blue flame that burns cleanly," explains Lyle. Other methods to reduce emissions in diesel engines are being pursued,

(Continued on next page)



ENERGY SYNERGY — Lyle Pickett, right, and Chuck Mueller (both 8362) are working on a project that could overcome the practical limitations of the Leaner Lifted-Flame Combustion engine, shown here in a test version. Paired with the right biofuel, the two technologies could enable a highly efficient, low-emission combustion strategy. (Photo by Randy Wong)

Math, science

(Continued from preceding page)

people with the same intellectual values."

To start off the awards ceremony, computer scientist Janine Bennett (8953) and systems analyst Julie Fruetel (8114) shared their personal stories. Both women said that in high school, they could not have envisioned their current professional success.

Janine is a computer scientist who builds mathematical and computer software tools to identify, characterize, and track features of interest in large-scale data. "When I was your age, I had no idea I would end up working at a national lab as a scientist in a research group," she says. "I spent a lot of time agonizing about picking a major and a college when I didn't know what I was going to do with the rest of my life."

She shared three pieces of advice that she wished she'd known back then: make careful, thoughtful decisions and then relax and go with it; enjoy what you do; and partner well in life. Janine advised the young women to identify both professional and personal support networks.

"If you decide to pursue a PhD, make sure you have a good advisor with whom you communicate well. That can be almost as important as the actual technical work," she said. "And make sure you partner well in life. I stressed a lot about the work-life balance, but my husband and I really value each other's careers. We have a 20-month-old son and while we do make sacrifices, we are making it work together."

Julie told the students that initially she was interested in journalism and didn't consider engineering until her junior year of high school. "I went to my high school guidance counselor and we made a plan of what I needed to do to apply to colleges with the best engineering programs," she said. "His message to me was 'You can do this,' and that was very meaningful to me."

That plan included taking chemistry, physics, and calculus in her senior year. Julie earned a bachelor of science degree in chemistry from Harvey Mudd College and then went on to earn a doctorate in pharmaceutical chemistry at the University of California, San Francisco. In both cases, she aimed high, attending the best schools she could.

At Sandia, Julie first worked in microfluidics on MicroChemLab, a handheld device to bring benchtop laboratory analysis methods into the field, and then moved into systems analysis. "There is no right or wrong path," she says. "No one could have predicted the arc I took."

In closing, Cathy told the awardees to keep up the good work, but also to keep in touch. "When you excel in math and science, doors open but it may not always be obvious what those doors are. Internships are a great way to explore career options," she said. "Sandia is a wonderful place to do those internships because of the breadth and kind of work that we do."

Julie's remarks hit home with Selena Chang, the Granada High School recipient for math. "I'm reconsidering the AP classes to take next year," she says. "I think I'll probably add AP chemistry."

Yanli Liu (8621) explains her research using a microfluidics device to study cellular signaling of rat basophil leukemia cells, which play an important role in allergies and inflammation. (Photo by Dino Vournas)

Sandia CaliforniaNews

Award Winners

Outstanding Achievement in Mathematics
Alysse Ketner, Amador High School
Alexandra Brown, Dublin High School
Alejandra Nieves, East Union High School
Selina Lao, Foothill High School
Selena Shang, Granada High School
Lynn Hao Tran, Livermore High School
Amanda Christensen, Manteca High School
Danielle Nghiem, Merrill F. West High School
Emily Spencer, Tracy High School

Outstanding Achievement in Science
Da Eun Kim, Amador High School
Nancy Zhou, Dublin High School
Britney Johnston, East Union High School
Victoria Liu, Foothill High School
Meagan White, Granada High School
Rachel Sowa, Livermore High School
Brooke Mejorado, Manteca High School
Chloe Pounds, Merrill F. West High School
Lucy Cui, Tracy High School

Special thanks to the Sandia hosts and Math & Science Awards Committee:

Sandia Hosts
Amanda Askin (8112)
Julie Fruetel (8114)
Mary Gonzales (8250)
Yalin Hu (8135)
Tammy Kolda (8966)
Jina Lee (8116)
Kirsty Leong (8651)
Kari Neely (85151)
Stacy Nelson (8259)
Jacquieline O'Connor (8632)

Committee
Glenn Kubiak (8600), director champion, SWC
Cathy Branda (8623), Chair
Donna Blevins (8953), co-chair
Marilyn Hawley (8116), co-chair
Seanna Crouch (8942)
Deneille Wiese-Smith (8128)

Sen. Bingaman tells Wind Turbine Blade Workshop that renewable energy important to US policy

By Sue Major Holmes

SPEAKING at the fifth annual Sandia-sponsored Wind Turbine Blade Workshop in Albuquerque, N.M., Sen. Jeff Bingaman told attendees that the transition of the national and world economies to renewable energy holds the promise of creating jobs in everything from research to manufacturing to installation. (Photo by Lloyd Wilson)

Sen. Jeff Bingaman says the on-again, off-again nature of US energy tax incentives and the uncertainty over federal spending on research and innovative technology present major challenges to the wind energy industry and other alternative energy industries.

Bingaman, New Mexico's senior senator, is chairman of the Senate Energy and Natural Resources Committee. He spoke May 30 at the opening session of the 5th Wind Turbine Blade Workshop, sponsored by Sandia. The workshop, the only one in the US devoted to wind turbine blade technology, has been held on even-numbered years since 2004.

A major focus of Sandia's program has been blade technology, including development and demonstration of innovations in its Wind Energy program, funded by DOE. The three-day workshop, which attracted about 260 participants, included sessions on blade research and innovative design, turbine design, blade and rotor testing, manufacturing and inspection, distributed wind technology, and water power.

Bingaman told the workshop that a diversity of US energy sources at a reasonable price equals security in the nation's energy supply and allows it to fight global warming.

"It's clearly in our interests to reduce greenhouse gas emissions," he said.

He also said the transition of the national and world economies to renewable energy holds the promise of creating jobs in everything from research to manufacturing to installation.

"We need some of these jobs to be American jobs, and that's why it is important for us to keep this as part of our national policy," Bingaman said.

But market forces are working against alternative energy in these days of cheap natural gas and developing shale gas, he said.

The senator, who is retiring at the end of the year, devoted much of his speech to reviewing how the federal government supports energy policy through spending, tax incentives, and regulations. He said it's been difficult getting consensus in Washington on how to use those powers for renewable energy.

Federal spending on alternative energy has come in the form of support for research and development, grants for innovative projects, and DOE's promotion of knowledge-sharing, he said.

Much of the federal spending on energy has been through the tax code. However, the production tax credit for wind power expires at the end of this year, Bingaman said. He added he does not expect action to extend tax credits until the lame duck session after the election as part of a larger tax policy.

"That's not a good way to make tax policy. It does not give developers and businesses the assurance they need to make plans and investments for the long-term," he said.

He also said some members of Congress oppose tax incentives and direct spending on clean energy because of concerns about budget deficits and opposition to government involvement in the market.

Bingaman suggested Congress could use its regulatory power to reduce greenhouse gas emissions by establishing a Clean Energy Standard. He introduced a measure in March that would award tax credits to all electricity-generating technologies that exceed the carbon efficiency of current supercritical coal generation. Utilities that sell electricity would acquire credits to meet the standard, which would become more rigorous over time.

Nation needs consistent energy policy

A Clean Energy Standard would give industry incentives and a long-term signal to pursue technology such as that focused on in the workshop, Bingaman said. But he acknowledged his bill does not have the support to pass.

Still, he said, the nation needs a consistent, sustained energy policy. During a question-and-answer session, he pointed out the US has competitors in alternative energy technologies, including China, which has "positioned itself and made it its business to be a world leader in deploying these technologies."

Daniel Laird, Sandia's manager of water power and offshore wind energy technologies, said China is the top market for wind energy, followed by the United States. China and India together, he said, account for 50 percent of the market. And while a Danish company remains the top manufacturer of wind turbines, four Chinese companies are in the top 10, he said.

Wind energy accounted for nearly 3 percent of the electricity generated in the US last year. Laird joked it finally has its own slice of a pie chart instead of being lumped in with other renewable energy.

Mark Higgins, chief operating officer of the Wind & Water Program in DOE's Office of Energy Efficiency and Renewable Energy, told the workshop the department believes "wind is the cornerstone to achieving deployable and efficient and cheap renewable energy."

DOE's role includes spending on renovation, bringing researchers together, offering test platforms, validating systems to increase investor certainty, creating a database of unbiased reports, and leveraging international cooperation with overseas laboratories, said Higgins, who spoke before Bingaman.

The department's wind program, he said, is focusing on land-based systems through improved turbines; off-shore developments, which he said are largely deep-water wind turbines that are a generation or two down the road; and distributed systems, which are small wind turbines such as those that run a pump and which can add generation capacity without requiring more transmission lines. Higgins said DOE also wants to leverage work done overseas on wind energy to help American industry.

Biofuels

(Continued from preceding page)

but they are difficult to control because fuel injection occurs long before combustion is initiated. LLFC offers a control advantage because fuel injection occurs simultaneously with combustion.

LLFC has been demonstrated in lab tests; however, the conditions are hard to reproduce in an engine using typical diesel fuel. The system needs low ambient temperature, something hard to sustain in an engine, and small nozzle holes to increase air entrainment, which may be incompatible with engine power requirements. An oxygen-rich fuel could overcome these difficulties.

"Every strategy has its tradeoffs. For example, LLFC with conventional diesel fuel may require high injection pressure, which can be costly," says Chuck. "But using an oxygenated fuel could reduce that need."

Since many biofuels are oxygenates, they should naturally enable LLFC. In addition, renewable biofuels should have lower greenhouse gas emissions over their life-cycle and would count toward the federal Renewable Fuel Standard. The potential synergy between an advanced combustion strategy and a renewable fuel is one of the main attractions of this project.

To meet current emission standards, modern diesel engines use a particulate filter. The black soot that in the past could be observed coming from the tailpipe of a bus or 18-wheeler is now trapped on the filter. The filter is periodically heated to consume the soot, but this requires more fuel, resulting in lower overall efficiency and fewer miles per gallon. LLFC may allow a diesel engine to meet emissions standards without the use of a particulate filter, thus avoiding this penalty.

"Even though biofuels have less energy per volume than regular diesel, if you can eliminate the particulate filter, overall efficiency improves, somewhat offsetting its lower energy content," says Lyle. In addition, removing the particulate filter would reduce the pumping work of the engine as well as the weight and cost of the vehicle. In fact, aftertreatment can cost as much as the powertrain for some engines.

The project has four main goals: to identify fuel properties that can be used to enable controllable LLFC; to increase fundamental understanding of LLFC; to identify and test possible fuels; and to enhance combustion models to capture the effects of key fuel properties on combustion in advanced combustion regimes. The work is sponsored by DOE's Vehicle Technologies Program.

RESEARCHER Chuck Mueller (8362) holds what could be the key to moving Leaner Lifted-Flame Combustion (LLFC) from the lab to the road — an oxygenated biofuel designed to capitalize on the engine's efficiency. An experimental version of the LLFC is shown in the background. (Photo by Randy Wong)

SolarTrak

(Continued from page 1)

sions based on its angle, and turns on machinery that moves solar equipment into position. It factors wind speed and other external information into performance.

"The computer uses electronic feedback to monitor where the machinery is in its range of motion. With that information and the position of the sun, it makes the two coincide," Tim says. "It's a simple process. It's prudent to hook up a PC every few months and check the clock, but mostly it runs and runs."

SolarTrak technology has been used in commercial, industrial, residential, and research applications. Precision Solar Technologies has put controllers to work in heliostat projects, solar furnace applications, solar trough facilities, photovoltaics, and fiber optic daylighting research, bringing natural light deep into the interiors of buildings.

Hundreds of SolarTrak controllers are in commercial use in 18 countries and have been used in research projects at Sandia and Oak Ridge national laboratories, Rensselaer Polytechnic Institute in New York, Walt Disney Imagineering, the University of Loughborough and the University of Reading in the United Kingdom, US universities, and private-sector entities including Emcore, Amonix, and Los Alamos Research Associates.

"I've put a SolarTrak controller on everything I know of that moves and has to point at the sun," Tim says.

An offer from Sandia

Tim grew up in Washington, D.C., and moved to Albuquerque in 1973 to attend the University of New Mexico. He studied architecture and learned computer programming in engineering courses included in the curriculum. He continued to study mechanical engineering after earning a bachelor's degree in 1977.

Tim went to work as a programmer for the Civil Engineering Research Facility, CERF, that was part of UNM's engineering department. "One day a fellow from CERF came in, sat on my desk, asked a few questions about programming and engineering structures, and asked if I wanted to be a contractor at Sandia working on their mainframe computers and doing structural analysis on the vertical axis wind turbine," he says. "Suffice it to say I said yes."

Tim joined the Labs' wind energy program as a contractor in 1977. He left nine years later and was quickly hired back as Labs staff by his supervisor Dick Braasch. "I went back to my old office and not a piece of paper or pencil had been moved since I left three months earlier," Tim says. "Dick brought me back in, and it was a great feeling of belonging."

PRECISION SOLAR TECHNOLOGIES owner Tim Leonard, foreground, and the company's project engineer, Tony Louderbough, hoist a mast that is part of the company's Prospector Mule trailer-mounted solar weather station. Precision Solar uses a tracking technology developed at Sandia as an integral part of the weather station. (Photo by Randy Montoya)

He stayed another five years, working in a variety of areas as his old friends in the wind group moved on to other projects.

Using the programming, assembly, and structural skills he developed at Sandia, Tim was hired by companies in the early 1990s to work on video gaming machines. That work taught Tim electronics. "I started designing digital boards and creating more elaborate games," he says.

Tim ran into Alex in early 1995 and licensed the solar tracking technology about a year later. Alex was still working on the project at Sandia, and he and Tim fine-tuned the technology to get it commercialized. "Alex was eight years into it when we started working together," he says. "It became a joint venture."

Tim built the business through word of mouth and a website. His first customer was a researcher at the University of Australia in Canberra. Other early customers included Arizona Public Service and Amonix, where Tim installed his first high-powered, large piece of tracking equipment, on a 30- by 40-foot, 19,000-pound array.

Tim's signature product is the Prospector, a stand-alone solar weather station to measure solar and atmospheric environments.

In addition to the station, Precision Solar produces other full systems that include motors, gear drives, mechanical arms, and frames that hold and move the solar arrays for power production or research. The company does new systems and retrofits older ones. Tim works from a home base in Tijeras with an electronics and assembly workshop, forklift, and loading dock to send trackers to far-off places.

Energy savings

Tim says doing work for Sandia helped him develop the business. "Sandia wanted a lower-cost tracker for their sun sensors, and that led to the Prospector," he says. "I also did a solar data acquisition system for another person at Sandia as well as other ancillary projects. Each time they approached me with a niche project it became a potential product line."

Rich Diver, a retired Sandian and solar engineering consultant, says Tim's trackers are cost-effective and "very robust." "The Prospector is a really nice product," he says. "It works well."

Santa Fe resident Ricardo Sanchez remembers going to Sandia, where his dad worked, and looking up at the solar tower. "I was amazed at what it could do," he says. "I was really psyched to have that type of technology on my home."

About five years ago, Sanchez installed 13 fixed solar thermal panels on his roof, but they didn't generate enough heat. "I met Tim and went with his mirror heliostat tracker that reflects sunlight onto the panels. It took my system from something that didn't work to something that worked," he says. "I used to have a $500 a month heating bill in the winter. Now it's $700 for the whole season. The tracker is perfect. I don't do a thing. It just works."

Tim says he's never regretted taking on the business. "I grew up with Erector sets and Lincoln Logs and was making things that moved since I was very young. Then I learned computers and electronics," he says. "This business has brought together every single aspect of everything I have learned either in school or on my own."

Alex died in 2005 after a lifelong struggle with cystic fibrosis. He lived to see the beginnings of a business founded on his technology. Tim says he and Alex became best of friends and that he believes Alex would have been proud of the growth of the business and that it accomplished his goal of bringing down the once-astronomical cost of precision solar tracking.

"To this day, every (circuit) board I make says 'Originally developed at Sandia Labs'," Tim says. "Alex gets the credit. I'm still looking for my first opportunity to dedicate a precision solar field in his name."

On the Web

For more information on Precision Solar Technologies and its SolarTrak products, visit precisionsolartech.com.

Solar nanowire array may increase percentage of sun's frequencies available for energy conversion

By Neal Singer

Researchers involved in creating electricity through photovoltaics want to convert as many of the sun's wavelengths as possible to achieve maximum efficiency. Otherwise, they're eating only a small part of a shot duck; that is, wasting time and money by using only a tiny bit of the sun's incoming energies.

For this reason, indium gallium nitride is looked upon as an interesting future material for photovoltaic systems. Changing the concentration of indium allows researchers to tune the material's response to collect the sun's energy from a variety of wavelengths. The more variations designed into the system, the more solar spectrum can be absorbed, leading to increased solar cell efficiencies. (Silicon, today's photovoltaic industry standard, is limited in the wavelength range it can 'see' and absorb.)

But there is a problem: Indium gallium nitride, part of a family of materials called III-nitrides, is typically grown on thin films of gallium nitride. But gallium nitride atomic layers have different crystal lattice spacings from indium gallium nitride atomic layers. This mismatch leads to structural strain that limits both the layer thickness and percentage of indium that can be added. So while it's true that the more indium added, the wider the solar spectrum that can be collected, it's also true that the more indium added, the less likely that the material can tolerate the strain.

Now Sandia scientists Jonathan Wierer, Jr. (1123) and George Wang (1126) report in the May 17 journal *Nanotechnology* that if the indium mixture is grown on a phalanx of nanowires rather than on a flat surface, the small surface areas of the nanowires allow the indium shell layer to partially "relax" along each wire, easing strain.

This relaxation allowed the team to create a nanowire solar cell with indium percentages of roughly 33 percent, higher than any other reported attempt at creating III-nitride solar cells. This initial attempt also lowered the absorption base energy from 2.4eV to 2.1 eV, the lowest of any III-nitride solar cell to date, and offering a wider range of wavelengths for power conversion. Power conversion efficiencies were low — only 0.3 percent (a standard commercial cell hums along at about 15 percent) — but the demonstration took place on imperfect nanowire-array templates. Refinements should lead to higher efficiencies and even lower energies.

Several unique techniques were used to create the III-nitride nanowire array solar cell. First, a top-down fabrication process was used to create the nanowire array. This meant masking a GaN layer with a colloidal silica mask, followed by dry and wet etching. The resulting array consisted of nanowires with vertical sidewalls and of uniform height. Next, shell layers containing the higher indium percentage of InGaN were formed on the GaN nanowire template via metal organic chemical vapor deposition. Lastly, In0.02Ga0.98N was grown, in such a way that caused the nanowires to coalesce. This process produced a canopy layer at the top, facilitating simple planar processing and making this a manufacturable technology.

The results, says Jonathan, although modest, represent a promising path forward for III-nitride solar cell research. The nano-architecture not only enables higher indium proportion in the indium gallium nitride layers but also increased absorption via light scattering in the faceted InGaN canopy layer, as well as air voids that guide light within the nanowire array.

The research was funded by DOE's Solid State Lighting Science Energy Frontier Research Center and Sandia's LDRD — Laboratory Directed Research and Development — program.

108 Sandians move into Distinguished, Senior ranks

Sandia's special appointments represent employees from all areas of the Labs' operations and from every division. Special appointments include individuals who have been promoted to the distinguished level of their job family and individuals designated as senior scientists, engineers or administrators. One hundred-eight Sandians have been honored with special appointments this year.

Placement in the distinguished level signifies a promotion to the fourth level of the job. This level is to be populated with a few exceptional employees who have distinguished themselves in their careers while at Sandia. This level is different from the other levels in that it is subject to a 10 percent population limitation to preserve the distinction of the level.

Advancement to the "senior scientist/engineer/administrator level is open to employees currently serving at the distinguished-level, or as managers, senior managers, or directors. The individuals promoted to the "senior" level are clearly associated with major Sandia programs and relied on to provide strategic vision and direction to major Sandia programs. Advancement to the senior level represents the pinnacle of Sandia's non-managerial staff positions.

A In the photos here, the individuals promoted to the senior scientist/engineer/administrator level have been identified as such. Otherwise, all others have been promoted to the distinguished levels of their respective job families.

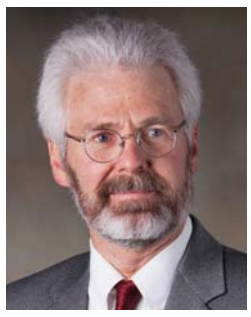
Not pictured here are: Richard Colbaugh (5635); Steve Cordova (1656); David Ingersoll (Sr Sci/Eng); and John Mckenney (1643).


Lynne Adams
10223

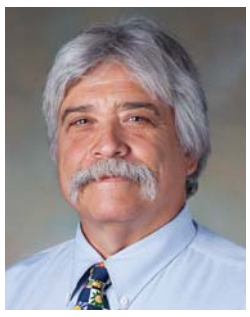

Mark Allendorf
Sr Sci/Eng 8651


Susan Altman
6915


Larry Andrews
733


Sanford Ballard
5736


Yvonne Baros
3510


Stephen Bauer
6914


David Beeson
2626

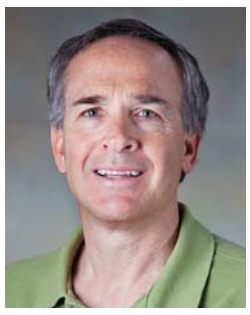

Judy Beiriger
5513


Gerald Boyd
5351


Nancy Brodsky
6921


Ileana Georgeta Buican
10680


Brett Chavez
8135


Leonard Connell
Sr Sci/Eng 245


Dan Curry
3653


William Curtis
5433

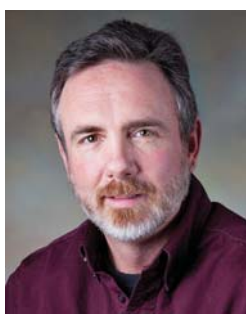

Randall Cygan
Sr Sci/Eng 6915


Daren Davidson
5417


Elouise Dickenman
10545


Douglas Doerfler
1422


Richard Elliott
2733


Stephen Gentry
5735


Micheal Glass
1545


Patrick Griffin
Sr Sci/Eng 2200


Mark Grubelich
6916


Everett Hafenrichter
2552


Julie Hall
800


Kevin Hall
9312


Francis Hansen
Sr Sci/Eng 6914


John Harding
4879


David Harmony
5342


Jeffrey Heller
9317


John Herzer
9537


Vincent Hietala
5638


George Hoskison
4128


Richard Hunt
5336


Patrick Hunter
1522


Michael Hutchinson
2718


Mark Ivey
6913


Leann Marie Jenkins
10243

Richard Jepsen
6122

Terry Johnson
8366


Scott Jones
245


Teresa Jordan-Culler
5422


Matthew Kiesling
6511


Dennis King
6916


Robert Knowlton
6632


Norman Kolb
2622


James Lauffer
8231


Stephen LeTourneau
9511


Joanna Lewis
1736


John Lewis
4225


Michael Lilly
1132


Roberta Lomadofkie
10547


Kevin Malone
5963


Carol Manzanares
3512


Charles Martin
2667


Anthony McDonald
1114


Sean Mckenna
Sr Sci/Eng 6912


Hope Michelsen
8353


James Morris
8531


Charles Mueller
8362


Prabal Nandy
5717

108 Sandians move into Distinguished, Senior ranks


Mathew Napier
5571


Danielle Nieto
4143


Mary Nolan
10621


James Novak
2542


May Nyman
6915


Beverly Ortiz
9342


Michael Pendly
5632


Alejandro Pimentel
1726


Marc Polosky
2614


Brady Pompei
6621


Thomas Post
2951


Harold Radloff
2122


Sandhya Rajan
1631


Susan Rempe
8635


Charles Rhykerd
6633


Steven Rice
254


William Rider
1443


Alfred Romo
10248


Paula Sanchez
423

Kevin Seager
6831

Sandia special appointments

continued on page 8

108 Sandians move into Distinguished, Senior ranks

(Continued from preceding page)


Darwin Serkland
1742


Christopher Shaddix
8367


Jason Stamp
6111


Alan Staton
1716


Joshua Stein
6112


Debra Stephens
2995


Daniel Summers
411


Roger Suppona
9317

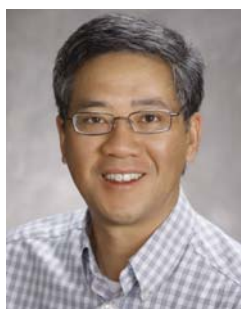

Peter Swift
Sr Sci/Eng 6620


Stefanie Terry
10657


Vincent Tidwell
6926


Steven Todd
5437


Thomas Togami
2122


Huu Tran
8634


Brian Van Leeuwen
5628


Roger Vesey
1644


Michael Vittitow
3654


David Walsh
2735


John Walter
4128


Frank Whiston
2111


Kevin Zavadil
1825

Holdren visit

(Continued from page 1)

president of the American Association for the Advancement of Science. With a doctorate in theoretical plasma physics at Stanford, he went to work at Lawrence Livermore National Laboratory in 1970, working in fusion energy, weapons, and lasers.

"I know first-hand how important and demanding the problems are that you deal with at Sandia," he said. Later, he said, "We are very happy in the White House to know there are assets of this quality [like Sandia] on which we can depend."

He led studies for President Clinton on the theft of nuclear materials, disposition of surplus weapons plutonium, prospects of fusion energy, and US R&D strategy. He also held professorial positions at Harvard University's Kennedy School of Government and at Harvard's Department of Earth and Planetary Sciences. He was Director of the Woods Hole Research Center.

Holdren noted that the administration has appointed a number of highly regarded scientists and engineers to positions of responsibility and has committed significant sums to pursue research.

"The president's commitment to [issues of science, technology, and fundamental research] are evident in the appointments he made: Five Nobel laureates — that has never happened in the history of the country — and 25 members of the National Academy of Sciences and National Academy of Engineering in leadership positions, more than ever appointed before," he said.

The President is interested in wide-ranging scientific partnerships — "The challenges are so big we can't afford not to partner," said Holdren.

The administration has supported revamping NASA so that it partners with private industry — he mentioned the recent success of the private-sector Falcon 9 mission in meeting with the International Space Station — and in supporting prizes for innovation in a variety of fields.

In other areas, the administration thinks the potential of "big data" computing is enormous in gaining insights into the larger and larger flow of data from space telescopes, genomics, materials science, and social media.


RESEARCHER SCOTT HEMMERT of Scalable Computer Architecture Dept. 1422, left, discusses the department's work with White House Science Adviser John Holdren, center, during Holdren's June 7 visit to Sandia. Looking on are (behind Scott) Dept. 1422 Manager Jim Ang; Labs Director Paul Hommert (behind Holdren); and Sandia Div. 1000 VP and Chief Technology Officer Steve Rottler (at right). (Photo by Lloyd Wilson)

In the domain of national security, the administration's thoughts run "from maintaining the security and effectiveness when needed of nuclear weapons, down to underwear bombs."

Noting that Sandia senior manager Pat Falcone has been nominated by President Obama as associate director for National Security and International Affairs, Office of Science and Technology Policy, Holdren said that if she is confirmed by the US Senate, "You folks at Sandia can be sure there'll be a leader in the White House who's connected to the way you see things."

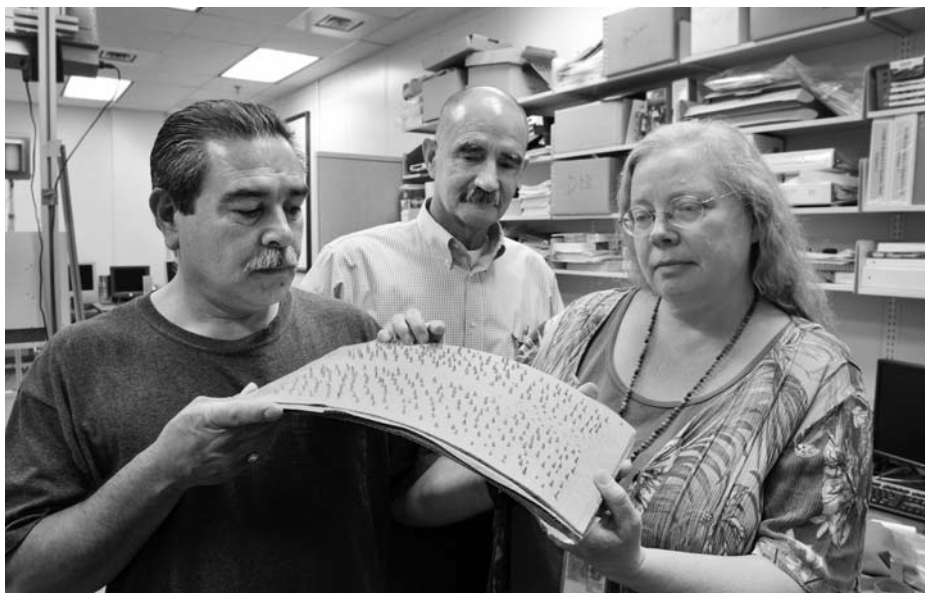
During a Q&A session, Holdren was asked whether the government should invest in developing "disruptive or incremental innovations." In response, he said that government responsibility is to maintain the fundamental science base — "we greatly boosted funding for research outside the box" — adding that there are federal agencies that are actively looking for disruptive technologies.

As for NASA and the budget for space exploration, Holdren said, "Because NASA has 20 pounds of mission on a 10-pound budget, we had to rebalance it." Because it cost $2.4 billion a year to maintain the space shuttle, Holdren said, "We couldn't afford to develop a successor if it kept flying." Instead, he said, "the most capable robotic rover ever conceived will land on Mars; at 6,000 pounds, it is the size of a big SUV." He said the agency also was laying out plans "to visit seven of the eight recognized planets — we won't talk about Pluto," he said to some laughter.

Asked whether — given the administration's interest in privatization — there were any plans to privatize nuclear weapons work, Holdren replied, "We're not going to commercialize lifetime extension programs. We're committed to maintaining the safety and reliability of our nuclear weapons obligations as long as they exist. The proposition must be maintained ironclad that they work when the president wants them to and not under any other circumstance."Finally, he talked about efforts to unravel the puzzle of low student science enrollment and worse, low retention in science education programs.

"We lose them because they come in with insufficient math, and because of the dullness of introductory courses," he said. "The question is, how do we get college teachers to employ best practices in teaching? In our research universities, the biggest criteria are all about research, not whether the teaching is cutting edge."

Threat detected!



VOLUNTEER Michael Moya (4848), Safe Zone Systems' Robby Roberson, and Mary Green (6612) assist viewing one of the threat packet inserts.

SAFE ZONE SYSTEMS' Robby Roberson and Mary Green (6612) assist Michael Moya (4848) in putting on the Concealed Threat Detector.

Sandia tests concealed threat detector intended to foil suicide bombers

By Stephanie Holinka • Photos by Randy Montoya

In early March, an intriguing item appeared in the *Sandia Daily News*, "Volunteers needed to test radar suicide bomber detector." How could anyone resist wanting to know more?

As it turns out, Sandia is evaluating a radar-based concealed threat detector developed to accurately alert security personnel to hidden materials on a person's body.

The Concealed Threat Detector (CTD), developed by Safe Zone Systems, looks for types of materials that a typical suicide bomber would be expected to incorporate around an explosive device, such as nails and bolts, rocks, ball bearings, glass or ceramic marbles, broken glass, or tile.

"These materials act as flying shrapnel, which is normally the cause of most injuries and deaths resulting from the detonation of a suicide bomb," says Mary Green (6612), project lead and security systems analyst.

SCAN MAN — The Concealed Threat Detector scans a subject suspected of wearing an explosive device.

The testing is funded by the New Mexico Small Business Assistance (NMSBA) program.

The device's inventors intend to use the system in screening areas such as airports, embassies, public and government buildings, border crossings, and transportation hubs. They're also looking to use it as a force-protection measure at military compounds in sensitive countries.

The device is intended to detect threats that current X-ray technology could miss, allowing potential threats to enter sensitive spaces such as airports and government buildings.

Two to six seconds per scan

The Concealed Threat Detector uses a spread-spectrum, continuous wave radar operating in the range of 10 gigahertz to bounce RF off the test subject. The software then looks for patterns in the target area that the unit has been "trained" on. The entire scan takes from two to six seconds.

The system has some advantages over current screening methods. Because the software is deciding whether objects of concern are present, human error is removed.

The radar-based screening can also be accomplished remotely, allowing for greater protection of its operator and guard force. Unlike X-ray screening, operators don't receive images, which could alleviate concerns related to privacy.

Since the testing process began, more than 80 Sandia employees have participated as test subjects in a process that was, at times, physically demanding.

During the evaluation, test subjects wear a vest with large pockets located both on the front and back. Targets are placed in the pockets, which correspond to locations where a real suicide bomber would likely try to hide shrapnel.

Test subjects are then asked to carry "threat packets" in the front and/or back pockets of the vest. The targets are packets of shrapnel materials weighing between 5 and 15 pounds, depending on the material being evaluated. For each test run, test subjects carry from zero to 28 pounds of shrapnel.

For each test run, the subject walks approximately 10 feet to the radar detection area, with arms extended. They stand still for four to six seconds, and then walk back. The Concealed Threat Detector device completes its scan, then the vest is re-configured with threat packets, and the next run begins.

Jerry Hauser, Safe Zone Systems' technical director, says previous testing gave the Concealed Threat Detector a detection rate ranging from 80 to 98 percent for common threat configurations.

Safe Zone Systems is a private company owned by the Roberson family, most known in New Mexico for building custom homes.

9/11 attacks spurred action

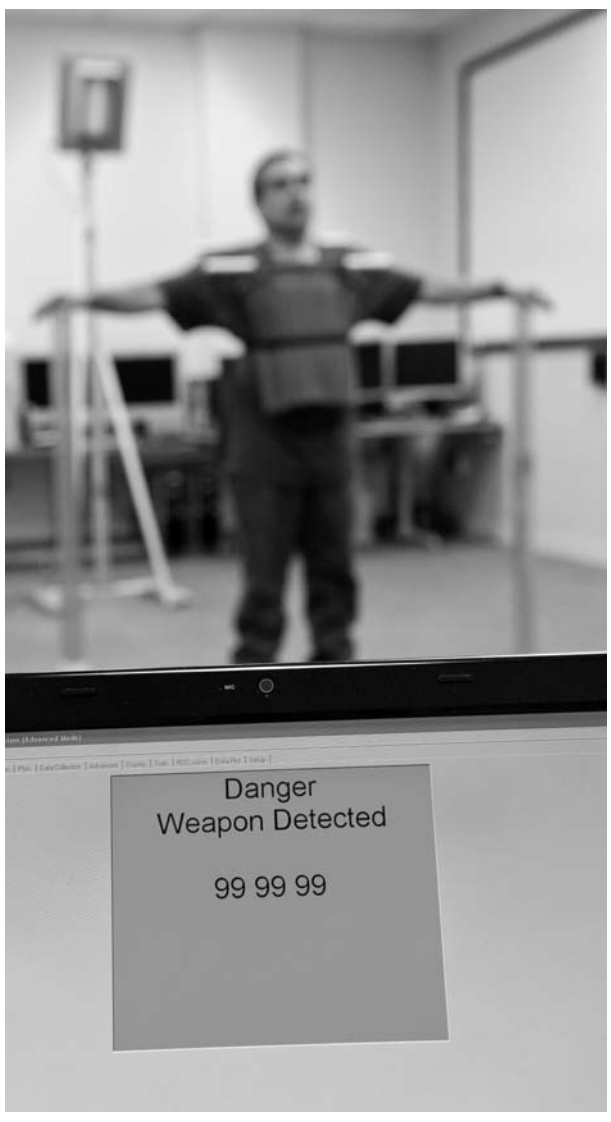
Coda Roberson and local businessman Chet Caldwell teamed up to develop a hand-held detector. They wanted to find out if they could make a difference in the protection of police officers. Their first hand-held product to detect weapons on suspects didn't work out, but they thought they could still do some good.

In 2001, right after 9/11, WWII veteran and Bataan Death March survivor Coda Roberson then came up with the idea of trying to use radar to detect the shrapnel that suicide bombers would have on their body. Coda is now 94 and still involved in the mission of Safe Zone on a daily basis.

Mary says the detector has completed this most recent round of testing, and that Safe Zone Systems has committed to making some modifications to its system that should allow it to realize a significant improvement to its already acceptable detection rates.

Robby Roberson, Coda's son who is assisting with the Sandia testing, says Safe Zone Systems is in the process of reaching out to current Sandia customers to locate a group that could assist in getting the Concealed Threat Detector out in the field for large-scale testing.

"The CTD is important because it will hopefully help protect our armed forces and citizens overseas, in areas where the suicide bomber is a real threat. And someday, that threat may hit US soil," Robby says.



CAUGHT! — The Concealed Threat Detector calculates a very high likelihood the subject is carrying explosives.

Computer heaven

Sandia's computing legacy comes to life in new museum

By Stephanie Hobby

Before John Long retired from Sandia last year, he gave his long-time officemate, David Heckart (9312), a cardboard box of computer-related memorabilia and urged David to make sure the contents were kept safe. Recognizing the historical significance of the items, David was planning to find some small shelf space to display the computer punch cards, magnetic tapes, old hard drives, and an early copy of Turbo Pascal compiler that John had collected after years of working at Sandia. However, as David started floating the idea with others, the vision grew. David enlisted John Noe (9328), and with the help of Susie McRee (9328), they began finding other treasures they knew had to be saved. Susie put an announcement in the *Sandia Daily News*, and items came flooding in.

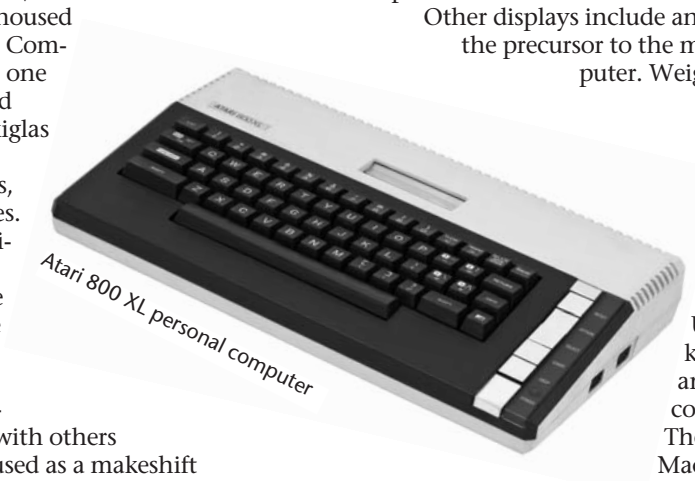
CURATORS — David Heckart (9312), left, Susie McRee (9328), and Sandia retiree John Long started work on the Computing and Communications Museum in Bldg. 880 more than a year ago. When John retired, he left his officemate, David, a box of historic computer items and asked him to make sure they weren't thrown away. Donations from other Sandians poured in shortly after that. The museum is open to anyone with access to the Limited Area during work hours. (Photo by Lloyd Wilson)


TRTS-80 Model III

What started as a small box is now a fully developed Computing and Communications Museum in Bldg. 880D, X hallway. The area, which serves as the entry to the Central Computing Facility, has more space available than in years past. Susie realized that it would be a perfect place to house the growing collection of historic items. With John Zepper's (9300) support, the museum started taking shape. Susie worked with historian Rebecca Ullrich (9532) and graphic designer Michael Vittitow (3654) to develop meaningful displays.

Cool Thunderbird cooling solution

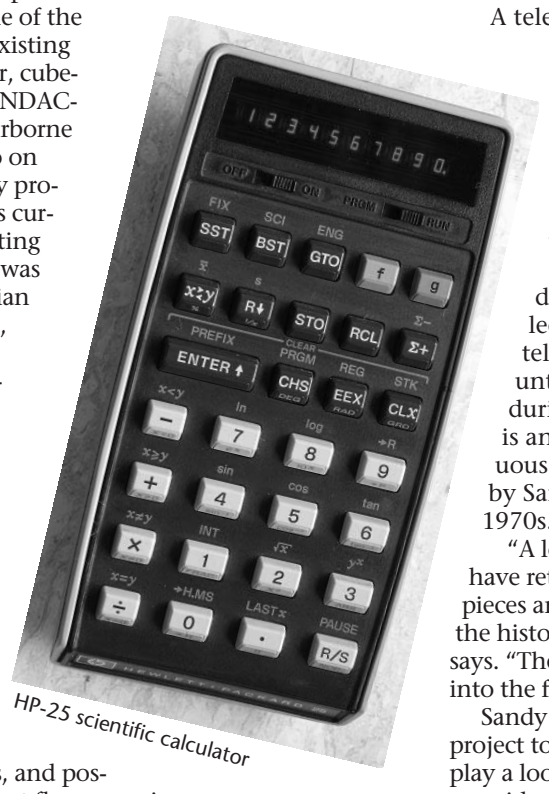
Susie secured four cabinets from the supercomputer ASCI Red, the world's first supercomputer to exceed one trillion operations in a second. Sandia collaborated with Intel to build the groundbreaking system. Susie worked with the Smithsonian to house two cabinets and sent another to the Computer History Museum in San Jose, Calif. A fourth is now housed in the Computing and Communications Museum; one side panel was removed and replaced with Plexiglas so visitors can see the power supplies, circuits, coolers, fans, and cables. To the right of the cabinet is a large panel of balloon fabric with the Thunderbird logo. The fabric was the brainchild of facilities coordinator Dave Martinez (9324), working with others on his team, and was used as a makeshift cooling device for the Thunderbird supercomputer. Sandia continues to be recognized nationally for its efforts in reducing supercomputers' energy consumption.


Atari 800 XL personal computer

A hand-wired core memory with service dates going back to 1967 is another highlight of the museum. At that time, core wires had to be strung by hand, which was a major limitation on memory size. The advent of RAM chips made hand-wired memory obsolete, but at one time, even Sandia's largest computers relied on the devices. During Take Our Daughters and Sons to Work Day, David Heckart explained to the students that it would take tens of thousands of such core memories to equal a single digital camera memory stick today.

"People say an era comes to an end when something has improved by a factor of ten," says John Long. "When you think of old hard drives that could store 32,000 words and were the size of washing machines, we've gone through several eras. Now, you can fit eight gigabytes in your pocket."

One of the last existing silver, cube-like SANDAC-IV, or Sandia Airborne Computer, is also on display. This early prototype to Sandia's current work in creating flight controllers was donated by Sandian George Davidson, who has since retired. The high-performance computer was designed for high-speed navigation. The model at the museum was one of the first parallel computers, was the first parallel machine flown on missiles, and possibly one of the first flown on airplanes. This research led to ASCI Red.


HP-25 scientific calculator

Other displays include an early Compaq Portable, the precursor to the modern laptop computer. Weighing 28 pounds and roughly the size of a sewing machine, it was more informally referred to as the "Compaq Luggable." There's also an Atari PC, which helped revolutionize the home computer industry. Users could connect the keyboard to a television set and have an affordable home computer for the first time. There's also a first-generation Macintosh computer. Interestingly, its screen is actually smaller than those of today's iPads.

"This museum strikes different people at different levels," David Heckart says. "Regardless of whether they worked in the desktop realm or the supercomputing realm, they have something they can relate to. This lets you see and appreciate the progression that we've gone through and what we continue to do."

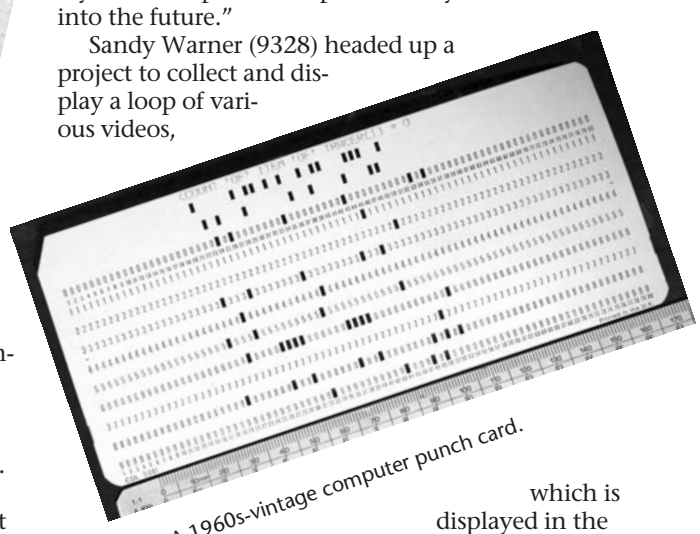
Telephones, too

A telephone collection had been housed in Bldg. 829, but access was highly restricted, and few people could see the collection. John Zepper requested the telephone collection be moved to the museum. Due to space limitation in the museum, Susie suggested using the alcoves in D aisle. Sue Lodato (10696) worked to move the phones to the new museum.

The collection now stretches in glass cases down one of the hallways in D aisle. The collection includes a Western Electric Model 302 telephone, which was in service from 1937 until the mid-1950s and was what Sandia used during its days as the Z Division. Also on display is an ominous-looking red phone with a conspicuous red light in place of a dial, which was used by Sandia's Emergency Operations Center in the 1970s.

"A lot of the people who worked on these items have retired but we've been able to collect a lot of pieces and preserve their important contributions to the history of computing and communications," Susie says. "The hope is to keep the history alive and take it into the future."

Sandy Warner (9328) headed up a project to collect and display a loop of various videos, which is displayed in the museum area. Doug Prout (3654) designed and assembled the timeline posters on display in D aisle and now at the main entrance to the labs in Bldg. 800.


A 1960s-vintage computer punch card.

"This is just a nice history lesson. We've added posters and technology timelines that begin with Sandia's origins and relate to historic events. Visitors can take a few minutes and really see where we've been and where we're going," says John Noe.

The museum officially opened on May 30 and is open to those with access to the Limited Area.

Golden Grads

Early Sandia master's program in spotlight at UNM Engineering graduation

By Nancy Salem

Commencement this year at the University of New Mexico School of Engineering featured a tribute to Golden Grads who earned their degrees 50 years ago. Standing among them were nine Sandians who were part of the first class of the Technical Development Program, or TDP, one of the Labs' earliest continuing education efforts.

Sixty-eight young engineers came to Sandia in 1960, drawn by the promise of challenging technical work and TDP — a half day on the job at the Labs and a half day of classes at UNM at full salary and with a master's degree in hand two years later.

"TDP was a fantastic program," says Heinz Schmitt, a member of the inaugural class who went on to become a Sandia VP. "We came in with bachelor's degrees and Sandia provided for our achieving a master's and valuable work experience. It was a marvelous continuing education opportunity for professional engineering people."

The UNM curriculum included a variety of disciplines in math, science, and engineering so the graduates would be well-rounded with a diversified portfolio. "Sandia management understood that the people they needed had to be multidisciplined," Heinz says.

And the class experienced first-hand a wide range of work being done at the Labs. Each participant was required to rotate through two organizations other than the sponsoring group. "It was a great opportunity to see the Laboratory and learn its culture," says Heinz, who chose the Computing and Product Development groups and stayed in the latter.

Sandia's earliest training efforts date to the 1950s. TDP was launched as a pilot program in 1959 with its first full class starting the following year. It was designed to create a pool of engineers with graduate-level skills. During its nine years, TDP helped 465 employees earn master's degrees in mechanical or electrical engineering.

"A large number of our key people, including multiple executives and directors, earned advanced degrees through the program," says Sandia VP and Chief Technology Officer Steve Rottler.

Bonds of friendship

TDP was phased out as hiring technical staff at the master's level became the norm. But it was the forerunner of subsequent university programs offering Sandians advanced degrees, such as One Year on Campus, or OYOC; the Special Master's Program; and the Doctoral Studies Program.

628 Employees Join Health Care Program, Enrollment Period Open Two More Days

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Program for Tech Development Begins July for New Engineers

Work Underway on Livermore Gaging and Inspection Facility

Three Talks Set For Research Meetings In Next Two Weeks

SANDIA LAB NEWS FRONT PAGE, Nov. 27, 1959, announcing a new Technical Development Program, a concentrated two-year course of graduate study for all new-hire EE's and ME's with bachelor's degrees. Last month, the first class of TDP enrollees celebrated the 50th anniversary of their graduation.

GOLDEN GRADS — (Left to right) Retired Sandians Heinz Schmitt, Anthony Russo, and John Kane gathered on the portico of the University of New Mexico Centennial Engineering Center to share remembrances of their time in the Labs' Technical Development Program. They were recruited to Sandia in 1960 and spent the next two years working and attending the UNM School of Engineering. They graduated with master's degrees in 1962 and this year joined the ranks of the school's Golden Grads.

"TDP was one of the foundations of education at Sandia," says Charline Wells, senior manager of Corporate Learning & Professional Development Dept. 3520. "It reinforced the Labs' long-term commitment to ensuring employees are prepared with the right set of skills for their current job and to reach their full potential and take us into the future. It's a legacy."

TDP also forged a close relationship between Sandia and the UNM School of Engineering, where most of the participants studied. "UNM Engineering has a rich history with Sandia," says Catalin Roman, the school's dean.

At this year's School of Engineering graduation reception, the Golden Grads shared stories of their time in TDP and of the bonds they formed.

"I wanted to get out of New York, and thought I would fit better at Sandia than at Bell Labs where I previously worked," says Heinz, who earned a bachelor's degree in mechanical engineering at the Polytechnic Institute of Brooklyn before being recruited by Sandia. "I was rewarded by a diverse range of technical and managerial experiences, and TDP was a key to making that happen for me."

Bob Alvis came from the University of Oklahoma, where "the smartest guy in the class" urged him to take Sandia's TDP offer. "I didn't have a dime to my name, and borrowed to get to Sandia," Bob says. "It was a godsend to be put through graduate school."

He says TDP changed the makeup of the Labs. "They had a lot of bachelor's degrees," says Bob, a mechanical engineer who worked in the weapons program and became a division supervisor. "TDP saturated it with master's."

John Kane, a University of Nebraska electrical engineer, picked Sandia and TDP for the chance to get a master's he couldn't otherwise afford, and because he didn't want to go to school east of the Mississippi. "That was my strategy, and it turned out to be a great thing for me. I stayed at Sandia 40-plus years."

John says the opportunity to change careers kept him engaged at the Labs. He worked in equipment design, advanced electromechanical components, systems, technical security systems, and intelligence, where he was a division supervisor.

Anthony Russo, who came from electrical engineering at the University of Notre Dame, says the class members had a lot in common. "We were all top people from the schools we came from, and helped each other out," says Anthony, who worked in aerodynamics, fluid mechanics, and thermal sciences. "It was very friendly."

Electrical engineer Paul Stokes came from North Dakota State University and worked in arms control and intelligence. "I came with no grand plans," Paul says. "I thought I might go to California. But after a couple of years, I liked what was going on at Sandia and liked the area. The TDP program was a big reason for that."

Sandia/UNM connection

Heinz, Bob, John, Anthony, and Paul stayed at Sandia more than 35 years and retired within a few years of each other, from 1998 to 2001. They say TDP bound them to the Labs and to each other. "It was a shared experience," Bob says. "We had a lot of fun."

"I had a relationship with 30 or 40 people throughout my career," John says.

Sandia's latest educational programs offer more options in schools and curriculum, and feature targeted programs such as computer science software engineering. Despite the broader choices, many Sandians still attend UNM.

"I'm thrilled that we're deepening and strengthening our relationship," says Dean Roman. "Some of the outcomes we're working on include increasing internship opportunities for our students, providing more top talent for Sandia, and expanding our strategic research collaborations."

For Sandia's members of the 1962 Golden Grad class of the School of Engineering, the place they started — TDP — will always be special.

"For me the program was a life-changer," Heinz says.