

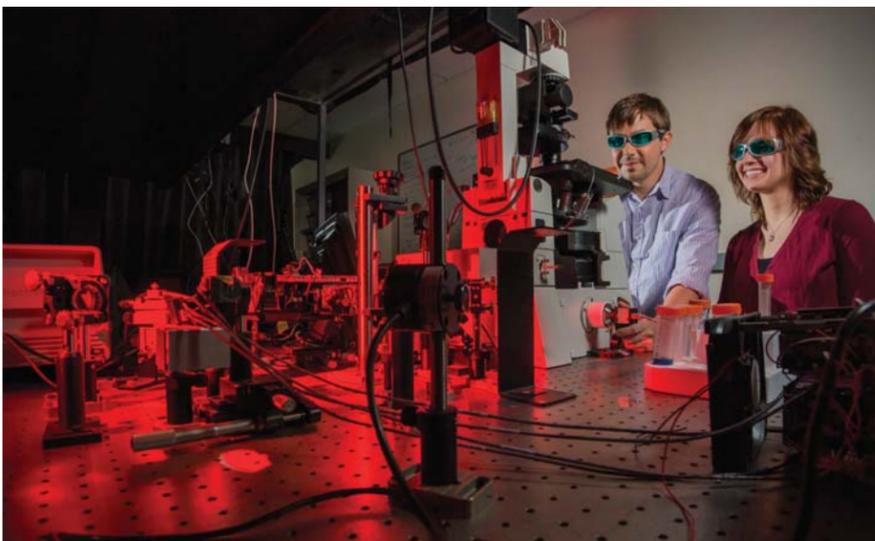


AS TWILIGHT SETTLES over Kirtland Air Force Base on an early December evening, KAFB employees Bill Velgus and Gary Park watch the magic happen at the base's annual tree lighting ceremony. The

two helped prepare the tree for the base's annual holiday festivities. Tree-lighting activities that had been planned for outdoors were moved to the base chapel. (Photo by Randy Montoya)

Turning biological cells to stone improves cancer and stem cell research

'Zombie' method also hardens biostructures for manufacture



SANDIA RESEARCHERS Bryan Kaehr (1815) and Kristin Meyer (1815) analyze a silicized surface using optical microscopy and multiphoton fluorescence. (Photo by Randy Montoya)

By Neal Singer

Changing flesh to stone sounds like the work of a witch in a fairy tale. But a new technique to transmute living cells into more permanent materials that defy rot and can endure high-powered probes is widening research opportunities for biologists who are developing cancer treatments, tracking stem cell evolution, or even trying to understand how spiders vary the quality of the silk they spin.

The simple, silica-based method also offers materials scientists the ability to "fix" small biological entities like red blood cells into more commercially useful shapes. And, at least in theory, the method can transmute naturally grown objects like livers and spleens into non-organic, "zombie" replicas that function simultaneously at a variety of length scales in more sophisticated ways than the most advanced machinery can produce.

"Why go to the trouble of making objects, if nature will do it for you?" asks Sandia lead investigator Bryan Kaehr (1815).

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Steve Rottler named Executive VP for National Security Programs

Jerry McDowell announces retirement after 35 years; Gary Sanders is new Div. 2000 VP

Sandia President and Labs Director Paul Hommert has announced that Steve Rottler has been named Deputy Laboratories Director and Executive VP for National Security Programs effective March 6.

Steve succeeds Jerry McDowell, who will retire in July after 35 years at Sandia. Jerry has been Executive VP since 2010.

Steve is VP of Sandia's California laboratory Div. 8000 and head of the Labs' Energy and Climate Program Management Unit, a position he's held since February 2013.

In announcing the transitions, Paul said Jerry has been instrumental in leading Sandia's core nuclear weapons mission. "His keen insight into Sandia's national security mission and his invaluable understanding of our customers have strengthened our institution," Paul said.

(Continued on page 4)



STEVE ROTTLER

For Kim Sawyer, joining Sandia was like coming home



Deputy Laboratories Director and Executive VP for Mission Support Kim Sawyer began her Sandia career four years ago. She sat down recently to talk with the Lab News about some of the things she's thought about and has done since coming to Sandia, what motivates her, inspires her, and where she thinks the Labs may be going over the next few years. See pages 6-7.

That's that

Based on a couple of emails I've received in the past week from the PR offices of other government agencies, I've become aware of a situation that should concern every true blue Sandian: There seems to be a growing Santa Claus Tracker gap – and we're on the wrong side of it.

The smart folks in Los Alamos National Laboratory's Intelligence & Space Research Division once again have a Santa Claus tracker website to keep kids around the world apprised of where Jolly Old St. Nick is as he makes his rounds on Christmas Eve. Since 1998, the LANL team has used high-end satellite tracking dishes and space-based sensors to follow the progress of the magical elf. Among other things, they're using an infrared sensor on the FORTE satellite (developed by LANL and Sandia and launched in 1997) to zero in on Rudolph's red nose. And thanks to the FAA-mandated transponder on Santa's sleigh, the LANL boffins are able to follow its progress using the radio receivers on board the FORTE, Cibola Flight Experiment, and Prometheus satellites.

Bringing this kind of heavy artillery to bear on the Santa tracking problem is impressive, but the fact is, LANL is just an upstart in this arena. NORAD has been tracking Santa since 1955. I remember sitting around the radio with my family (yep, people really did that) as a news reader issued regular updates on Kris Kringle's whereabouts. The data probably came from NORAD (or, more correctly, NORAD's predecessor organization, CONAD, the Continental Air Defense Command in Colorado Springs).

As you can imagine, my eyes were all aglow as Santa drew closer and closer to Lebanon, Tenn., where we were living. By the time we kids finally went to bed, probably around 9 o'clock, Santa was up around Winnipeg and working his way south. While we were sleeping Mr. Claus and Co. obviously completed their appointed rounds, because on Christmas morning there was my longed-for Davy Crockett coonskin cap and popgun version of Davy's beloved "Old Betsy" long rifle. Santa Claus! What a guy! A Christmas to remember, for sure, made all the sweeter by the delicious anticipation of hearing the reports of Santa inching closer and closer and closer as our bedtime drew near.

As I got a bit older and began to understand some of the dynamics of the Cold War, I imagined a conversation in a Soviet war room: "We attack at midnight on their Christmas Eve when tracking systems are following Father Frost!" "Dah!" And when I was older still, that imagined conversation took a slightly different turn: "We attack at noon on Tuesday when they test their air raid sirens!" "Dah!" As an aside, I'm grateful my kids didn't have to live through any of that, for which we can thank, in no small part, Sandia.

But back to the Santa tracking gap: LANL and NORAD are heavy hitters in this important endeavor, but a quick Google search reveals a blizzard of Santa trackers out there: Google itself is in on the action, as are The Weather Channel, NASA, Airlines Australia, and a host of dedicated websites. They're all following Santa's every move on Christmas Eve, making him perhaps the most watched global male celebrity since Justin Bieber melted down in Montreal (or was it New York?)

Clearly, in this crowded field there's no room for Sandia to jump in, but that doesn't mean we can't get in on action in our own way. There's always the Easter Bunny. That whole field is wide open. With our capabilities, I'll bet we could do the Santa trackers one better; they only follow Old St. Nick on Christmas Eve. I propose we track the Easter Bunny 24/7/365. I for one would love to know where he goes when he's not hop, hop, hopping down the bunny trail.

As I wrap this up another thought occurs to me. Maybe we are tracking Santa. Maybe we're flying below the radar, keeping our own counsel. After all, there are some things we do here that we just don't talk about.

See you next year!

— Bill Murphy (MS 1468, 505-294-1778, wtmurph@sandia.gov)

Steve Rottler, Gil Herrera named AAAS fellows

By Patti Koning

Div. 8000 Vice President Steve Rottler and Gil Herrera, director of the Microsystems Science, Technology, & Components Center 1700, have been elected as fellows of the American Association for the Advancement of Science (AAAS). This honor is bestowed upon AAAS members by their peers.

Steve currently serves as the executive leader of the Laboratories' energy and climate program management unit. Effective March 6, he will become the deputy Labs director and executive vice president for national security programs. AAAS recognized Steve for his "outstanding contributions through the leadership of science and engineering organizations in a national security laboratory."

Prior to moving to Sandia/California, Steve guided corporate research and development efforts as Sandia's chief technology officer and vice president of science and technology. Before that, he was the chief engineer for nuclear weapons and the vice president of weapon engineering and product realization. He has also held other leadership roles within Sandia's nuclear weapons mission with responsibilities for nuclear warhead system engineering and integration, the development of high-performance electronic systems, and system analyses and assessments. Early in his career at Sandia, Steve conducted research in radiation hydrodynamics and managed computational fluid dynamics research.

Steve is a fellow of the American Institute of Aeronautics and Astronautics, a recipient of the Air Force Exemplary Civilian Service Award, and an alumnus of Seminar XXI at the Massachusetts Institute of Technology Center for International Studies. He serves or has served on the boards of directors of the United Kingdom's Atomic Weapons Establishment; the New Mexico Humanities Council; Explora, a science center and children's museum in Albuquerque; and Technology Ventures Corp.

Gil, the head of Sandia's Microsystems and Engineering Sciences Applications (MESA) complex, was cited by AAAS for "distinguished contributions to microelectronics for national security applications and professional service to the national security community."

Gil's contributions extend beyond his work at Sandia. From 1997 to 1999, while on a leave of absence from Sandia, he served as the chief operating officer of SEMI/SEMATECH, a consortium of US suppliers of semiconductor manufacturing equipment and materials. He also took a leave of absence from 1991 to 1992 to serve as an AAAS/Sloan Foundation science & technology policy fellow at the White House's Office of Science and Technology Policy during President George H. W. Bush's administration.

Gil serves on advisory boards for the Jet Propulsion Laboratory, the University of Michigan, the University of New Mexico, and the Council on Competitiveness. He is also a member of the Army Science Board, where he has led several studies. The Department of the Army has recognized Gil's service with a Commander's Award for Civilian Service and a Certificate of Appreciation for Patriotic Civilian Service.

This year 401 members were elected as AAAS fellows because of their scientifically or socially distinguished efforts to advance science or its applications. New fellows will be presented with a certificate and a gold-and-blue (representing science and engineering, respectively) rosette pin on Feb. 14 at the AAAS Fellows Forum during the 2015 AAAS annual meeting in San Jose, Calif.



Steve Rottler, vice president of Sandia's California laboratory and fellow of the American Association for the Advancement of Science.



Gil Herrera, director of Sandia's Microsystems Science, Technology and Components Center and fellow of the American Association for the Advancement of Science.



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Storing hydrogen underground could boost transportation, energy security

Sandia California News

By Mike Janes

Large-scale storage of low-pressure, gaseous hydrogen in salt caverns and other underground sites for transportation fuel and grid-scale energy applications offers several advantages over above-ground storage, says a recent Sandia study sponsored by the Department of Energy's Fuel Cell Technologies Office.

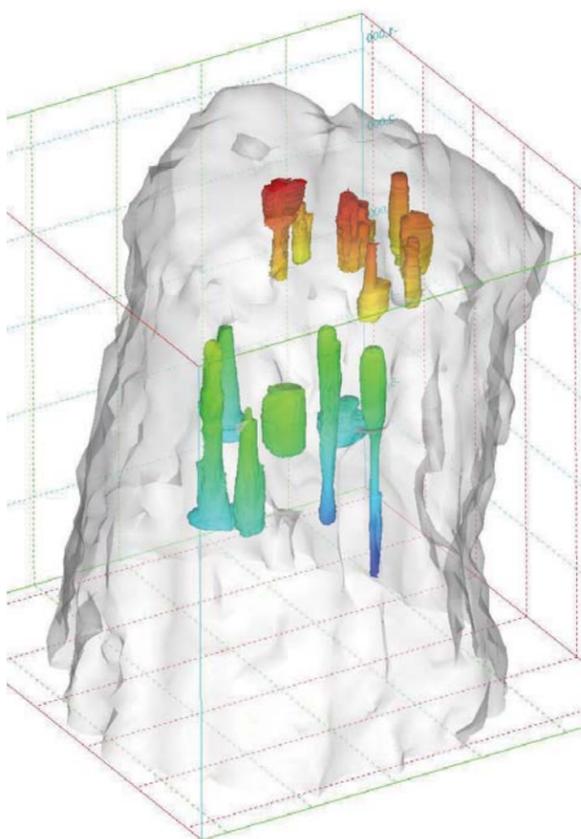
Geologic storage of hydrogen gas could make it possible to produce and distribute large quantities of hydrogen fuel for the growing fuel cell electric vehicle market, the researchers concluded.

Geologic storage solutions can service a number of key hydrogen markets since "costs are more influenced by the geology available rather than the size of the hydrogen market demand," says Anna Snider Lord (6912), the study's principal investigator.

The work, Anna says, could provide a roadmap for



A SALT SOLUTION — Sandia researchers have determined that salt caverns could make excellent storage sites for gaseous hydrogen.



SALT CAVERNS such as the one depicted here could provide a low-cost solution for the geologic storage of hydrogen. The colors in the illustration represent depth, with blue as the deepest part of the cavern and red the most shallow.

further research and demonstration activities, such as an examination of environmental issues and geologic formations in major metropolitan areas that can hold gas. Researchers could then determine whether hydrogen gas mixes with residual gas or oil, reacts with minerals in the surrounding rock, or poses any environmental concerns.

Storage seen as key to realizing hydrogen's market growth

Should the market demands for hydrogen fuel increase with the introduction of fuel cell electric vehicles, the US will need to produce and store large amounts of cost-effective hydrogen from domestic energy sources, such as natural gas, solar, and wind, says Daniel Dedrick (8367), Sandia hydrogen program manager.

As Toyota, General Motors, Hyundai, and others move ahead with plans to develop and sell or lease hydrogen fuel cell electric vehicles, practical storage of hydrogen fuel at large scale is necessary to enable wide-

spread hydrogen-powered transportation infrastructure. Such storage options, Daniel says, are needed to realize the full potential of hydrogen for transportation.

Additionally, installation of electrolyzer systems on electrical grids for power-to-gas applications, which integrate renewable energy, grid services, and energy storage, will require large-capacity, cost-effective hydrogen storage.

Storage above ground requires tanks, which cost three to five times more than geologic storage, Anna says. In addition to cost savings, underground storage of hydrogen gas offers advantages in volume. "Above-ground tanks can't even begin to match the amount of hydrogen gas that can be stored underground," she says.

The massive quantities of hydrogen stored in geologic features can subsequently be distributed as a high-pressure gas or liquid to supply hydrogen fuel markets.

Model helps identify the most favorable storage locations

While geologic storage may prove to be a viable option, several issues need to be explored, says Anna, including permeability of various geologic formations.

A geologist in Sandia's geotechnology and engineering group, Anna for years has been involved in the geologic storage of the US Strategic Petroleum Reserve, the world's largest emergency supply of crude oil.

For her study on geologic storage, Anna and her colleagues analyzed and reworked the geologic storage module of Argonne National Laboratory's Hydrogen Delivery Scenario Analysis Model. To help refine the model, Anna studied storing hydrogen in salt caverns to meet peak summer driving demand for four cities: Los Angeles, Houston, Pittsburgh, and Detroit.

She determined that 10 percent above the average daily demand for 120 days should be stored. She then modeled how much hydrogen each city would need if hydrogen met 10, 25, and 100 percent of its driving fuel needs.

Los Angeles has three times the population of Detroit and more than six and a half times the population of Pittsburgh, but the nearest salt formations are in Arizona, so Anna included the cost of getting the stored hydrogen from Arizona to Los Angeles.

Even so, Los Angeles' modeled costs are significantly less than those for Detroit and Pittsburgh. Salt formations in Arizona are thicker than those for Detroit and Pittsburgh, with larger and fewer caverns. Houston has the best conditions of the four cities because the Gulf Coast offers large, deep salt formations.

To examine the cost of geologic hydrogen storage, Anna started by selecting geologic formations that currently store natural gas. Working with Sandia economist Peter Kobos (6926), Anna analyzed costs to store hydrogen gas in depleted oil and gas reservoirs, aquifers, salt caverns, and hard rock caverns.

Their paper, "Geologic storage of hydrogen: Scaling up to meet city transportation demands," was published in the *International Journal of Hydrogen Energy*.

A geologic solution for peak period storage

Other fuels are already stored geologically. Oil from the Strategic Petroleum Reserve, for example, is held in large man-made caverns along the Gulf Coast. Natural gas is stored in more than 400 geologic sites to meet winter heating demands.

Anna envisions that excess hydrogen produced throughout the year could be brought to geologic storage sites and then piped to cities during the summer, when the demand for driving fuels peaks.

Depleted oil and gas reservoirs and aquifers initially seem the most economically attractive options, she says. "Just looking at numbers, because they can hold such a larger volume relative to any cavern you create, they look cheaper," she says.

But hydrogen gas is a challenging substance to store. "Because it's a smaller molecule than methane, for example, it has the potential to leak easier and move faster through the rock," Anna says.

Depleted oil and gas reservoirs and aquifers could leak hydrogen, and cycling — filling a storage site, pulling hydrogen out for use and refilling the site — can't be done more than once or twice a year to preserve the integrity of the rock formation, Anna says.

With a salt cavern or hard rock cavern, "there are no permeability issues, there's really no way anything can leak," she says. "You can bring more product in and out, and that will, in the long run, decrease your costs."

Hard rock caverns are relatively unproven; only one site holds natural gas. But salt caverns, which are created 1,000 to 6,000 feet below ground by drilling wells in salt formations, pumping in undersaturated water to dissolve the salt, then pumping out the resulting brine, are used more extensively and already store hydrogen on a limited scale, Anna says.

Future challenges

Anna says her work could lead to demonstration projects to further cement the viability of underground hydrogen storage. Salt caverns are the logical choice for a pilot project due to their proven ability to hold hydrogen, she says. Environmental concerns such as contamination could also be further analyzed.

However, salt formations are limited. None exist in the Pacific Northwest, much of the East Coast and much of the South, except for the Gulf Coast area. Other options are needed for development of a nationwide hydrogen storage system.

Anna's work adds to Sandia's capabilities and decades of experience in hydrogen and fuel cells systems. Sandia leads a number of other hydrogen research efforts, including the Hydrogen Fueling Infrastructure Research and Station Technology (H2FIRST) project co-led by the National Renewable Energy Laboratory (NREL), a maritime fuel cell demonstration, a development project focused on hydrogen-powered forklifts, and a recent study of how many California gas stations can safely store and dispense hydrogen.

Retiring Div. 2000 VP Bruce Walker looks back on 37 years at Sandia

By Sue Major Holmes

Sandia has changed and grown in the three-plus decades since retiring Div. 2000 VP Bruce Walker joined the Labs to work on the design of nuclear weapons systems and radar programs.

Over those years, Sandia's mission and work diversified, and it gradually shifted from primarily a nuclear weapons lab to a national security lab.

"We grew into energy and nonproliferation programs, and we grew into other national security contributions, such as with the Department of Defense," Bruce says.

He lists concurrent changes in the world: the military buildup of the 1980s, the end of the Cold War, two Gulf wars, and an ongoing war on terrorism. Through it all, he says, Sandia has been able to contribute to the nation's security without the huge ups and downs many industries went through.

"It's been remarkably stable here because of our diversification," he says. "We've been able to meet other needs in national security as the world has evolved and as the needs for national security have changed."

Bruce will end his 37-year career in mid-December to spend more time with his family, spend a lot more time traveling, and catching up on hobbies he has put on hold for years.

He says he'll miss the people of Sandia and the intellectual challenges.

"I'll miss the feeling we all get when we see a positive impact from our work. I'll miss all those things," he says.

Wrapping up a 37-year career

Bruce joined Sandia in 1977, and wraps up his career as the Labs' chief engineer for nuclear weapons, a position he's held since 2011. Over the course of his career, he was director of four separate centers. As vice president of Weapons Engineering and Product Realization, he's responsible for stockpile systems and for leading engineering design and development activities for the weapons program.

He helped start Sandia's work in Synthetic Aperture Radar (SAR) by proposing SAR for navigation on a maneuvering re-entry vehicle. He recalls that it was one of the Labs' first Laboratory Directed Research and Development proposals, what was then termed the Tech Based Tax program. This project began Sandia's work in SAR, a program which has grown to more than 100 people and has made numerous contributions to national security. Bruce holds a patent in synthetic aperture radar for video SAR.

He is most proud of being a significant part of both the nuclear weapons program and the Laboratories' Strategic Partnerships Program, formerly Work for Others. He first joined the NW program in

radar fuzing, and later worked on W76-1 components and systems.

Sandia still faces an enormous challenge in sustaining the nuclear weapons program since it plays a key role in those efforts and has commitments it needs to meet over the next decade and beyond, he says.

"The average age of a US nuclear weapon is growing older, and we have to extend the life of those systems," Bruce says. "We have a tremendous challenge to make the necessary modernizations to extend the lifetime of our weapons systems. We have the W76-1 in production; we've got the B61-12, the W88 ALT, the Mark 21 fuze, all three in engineering development; and we've got the W80-4, the next generation cruise missile system, in advanced concept development. So there's a tremendous effort in the nation to address the needed life extension of these systems."

Bruce advises Sandians to keep learning

He has no regrets about the course of his career, although he says that in looking back, you always see things you would have done differently. "I try to learn from my mistakes and improve and focus on how I can do better in the future. At any given project or any given era, there are always things I've looked back on and said, 'Ah, I might have done that differently.' But I just try to learn from that and focus on doing better in the future."

His advice for Sandians: continue learning and improving yourself. "Have a passion for a cause greater than yourself. Life's too short not to have a passion for a significant cause," he says.

He also suggests approaching the job as if you'd hold it until retirement. "I think the level of accountability, the level of commitment to the job, is much different when you sincerely have that feeling that you're going to be in this job to the day you retire," Bruce says. In addition, he says, following that principle "prevented me from taking jobs I wasn't all that interested in. I always wanted to have that level of

commitment and interest in a job."

"I've enjoyed my career at Sandia," Bruce says. "I came here not knowing how long I'd stay. It seemed a good place to work although I wasn't that familiar with Sandia when graduating from college. I've stayed a long time because I've enjoyed it. I've felt fulfilled by the work and certainly enjoyed working with the people. And most of all, I've felt an opportunity to contribute to national security that I wouldn't have been able to make at many other places."



BRUCE WALKER, second from left, greets US Secretary of Defense Chuck Hagel during the secretary's visit to Sandia last January. (Photo by Randy Montoya)



IN THIS 1984 LAB NEWS PHOTO Bruce Walker, right, was announced as the new supervisor of Sensor Applications Div. II 324. With Bruce is Doug Robertson, who was named manager of Technical Information Dept. 3150.

New VPs announced

(Continued from page 1)



JERRY McDOWELL

In addition to serving as EVP for National Security Programs, Jerry has been acting VP for Defense Systems and Assessments Div. 5000 since Jeff Isaacson left the Labs in October. Paul said an announcement regarding a new VP for the division will be forthcoming when that position is filled, as will an announcement for a new VP of Div. 8000.

In another executive transition, Paul announced the appointment of Gary Sanders as VP of Weapons Engineering and Product Realization Div. 2000 and chief engineer for nuclear weapons. Gary succeeds Bruce Walker, who is retiring after 37 years at Sandia, the last three in the vice president's role (see story above).

At Sandia's California site, Steve oversaw principal missions, including nuclear weapons stewardship;

homeland security with a focus on defending against weapons of mass destruction; combustion, transportation, and hydrogen energy research; biology; and advanced computational and information systems.

Before taking the helm in California, Steve guided corporate research and development efforts as Sandia's chief technology officer and VP of Science and Technology Div. 1000. He has also held leadership roles within Sandia's nuclear weapon mission area, including as chief engineer for nuclear weapons and VP of Div. 2000, where he led Sandia's nuclear weapon engineering and production activities.

Early in his career, Steve managed computational fluid dynamics research and development at Sandia. He was also part of a research team that developed multidimensional radiation-hydrodynamics codes, and he led projects that supported the development of advanced nuclear and conventional weapon concepts.

Steve was recently elected a fellow of the American Association for the Advancement of Science (AAAS), an honor bestowed upon AAAS members by their peers. He also is a fellow of the American Institute of Aeronautics and Astronautics and a former member of the institute's board of directors. He is a recipient of the Department of the Air Force Award for Exemplary Civilian Service and serves or has served on the boards of the United Kingdom Atomic Weapons Establishment, New

Mexico Humanities Council, the Albuquerque Explora Science Museum, and Technology Ventures Corp.

Gary served most recently as deputy chief engineer for nuclear weapons and director of weapon systems engineering at the New Mexico site. Prior to becoming deputy chief engineer, he served as the principal technical adviser for nuclear plans and policies to the secretary of the Air Force.

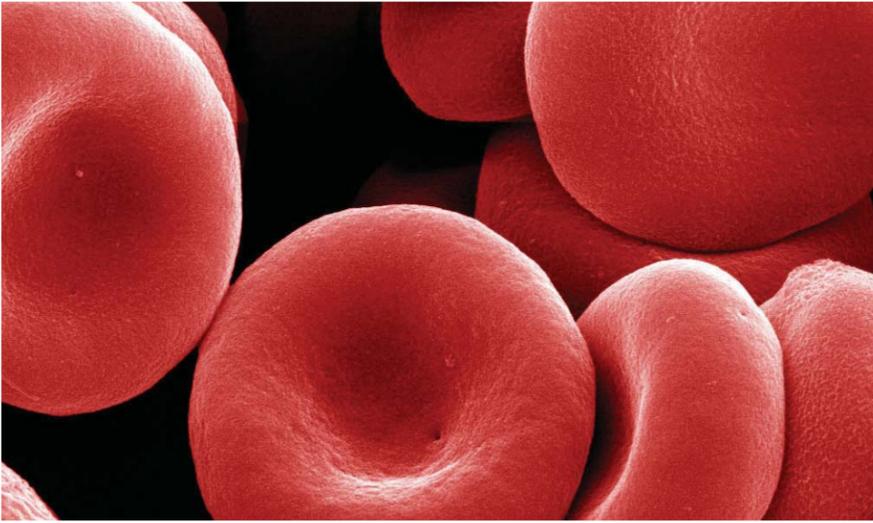
Gary has held multiple leadership roles at Sandia in nuclear weapon safety, weapon systems engineering, and facilities management and construction, and he has served as weapons program director. He also has held positions at DOE headquarters in Washington, D.C., and with the Air Force Office of Nuclear and Counterproliferation in the Pentagon.

He is a recipient of the Department of the Air Force Award for Exemplary Civilian Service and the Air Force Decoration for Exceptional Civilian Service.

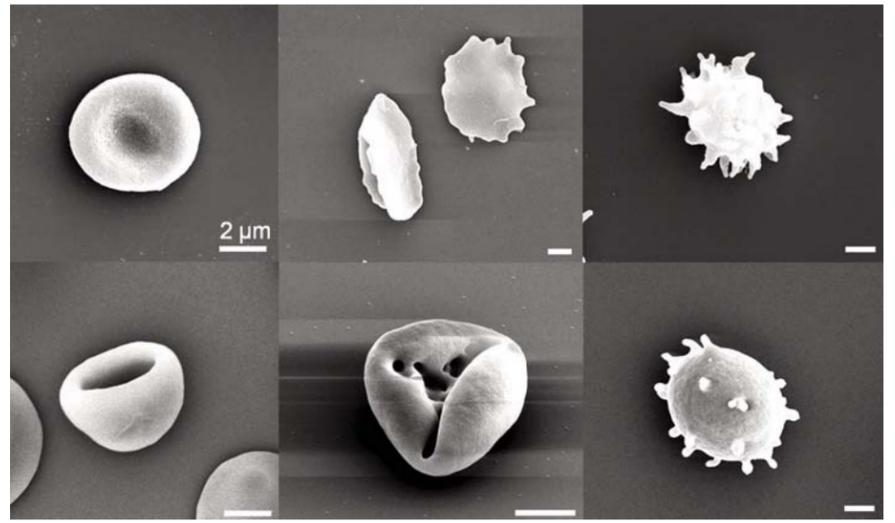
Gary joined Sandia in 1980 and has 34 years of experience in nuclear reactor and nuclear weapons engineering and safety design.



GARY SANDERS

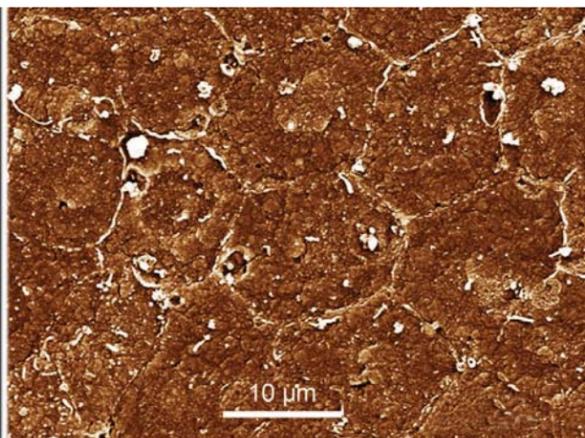


RED BLOOD CELLS before being distorted into spiky spheres by the Sandia and University of New Mexico technique for possible commercial use. (Image courtesy of Sandia National Laboratories)



PARTICLE SHAPES achieved from distorted and then 'fixed' red blood cells. (Images courtesy of Sandia National Laboratories)

'Zombie' method also hardens biostructures for manufacture



CHICKEN FEET, LEFT, AND SKIN-CELLS turned to glass by the Sandia and University of New Mexico silicizing process. (Images courtesy of Sandia National Laboratories)

(Continued from page 1)

The unusual method has been the subject of papers in *Proceedings of the National Academy of Sciences*, the *Journal of the American Chemical Society* (JACS), and most recently, *Nature Communications*.

Perfectly replicated cells

The initial insight came when Bryan and then-University of New Mexico postdoctoral student Jason Townson discovered that the silica slurry they were using had an unexpected property: At a reasonably low pH level, the silica molecules, instead of clotting with each other, bound only to surfaces against which they rested, forming the thinnest of coatings.

Bryan wondered if a similar coating on biological cells would strengthen cell structures so they could be examined for longer periods with more powerful tools. So the researchers put cultured tissue cells in a silica solution and let the mix harden overnight. Then they raised the temperature to burn off the biomaterial. What remained, astonishingly, were perfectly replicated cells, like little row houses of glass.

The replicated cells were so sturdy that Bryan surmised that the slurry must have coated the cells inside as well as out. Breaking a row of cells as one would a tiny pane of glass, the team examined their interiors with an electron microscope. They found they had indeed replicated the nanoscopic organelles of the cell as well as its exterior. They had discovered a way to create a near-perfect silica counterfeit of a biological organism, from its overall shape down to its nanostructures.

This initial result is already being used by biologists in Finland to create three-dimensional models that preserve the different stages of stem cells as they evolve to their final form, says Sandia Fellow and paper co-author Jeff Brinker (1000), who is also a UNM professor.

Townson, now on the faculty at UNM, uses the method to research the movements of cancer-fighting nanoparticles inserted into chicken cells prior to their conversion to silica. "With optical microscopy, it is difficult to form an image of the interactions of nanoparticles with cells while preserving a three-dimensional context," he said. Bioreplication, where the sample can be mechanically dissected and investigated with electron microscopes, offers better three-dimensional resolution at the nanoscale.

The method is also being used in England's Oxford University to study the internal biological changes by which spiders create different types of silk, adjusting their mechanisms on the fly (so to speak) to create

thicker or stickier strands, says Jeff.

Permanent alterations

In the *JACS* article, Bryan's group showed they could use the silica technique to make permanent alterations in natural objects. They introduced chemicals that transformed red blood cells from life-saver-like objects to spikey spheres. By then introducing the silica slurry to the dish containing the altered red blood cells and letting the mixture harden, Bryan and colleagues made the change permanent. Burning off the protoplasmic original, the team was left with microparticles that might be useful in rubber composites created by tire companies that routinely insert silica spheres in their tire mix for additional strength. Manufacturers would no longer need an energy-consuming factory to make the inserted material which, by bioreplication, would form cheaply and easily.

"I have a proposal with a major tire manufacturer to use this method to create tire additives," says Bryan. "Our method has good potential over traditional silica additives, and its raw material — blood — is considered a waste product in the meat industry. I've done a back-of-the-envelope calculation as to its potential yield from bovines per year; it would work."

In addition to food industry waste products, he says, "there's a huge amount of harmless bacteria out there we could co-opt to create still other shapes." Bacteria are harder to harvest, he says, because they are protected by a double sheath against silica invasion, but it could be done.

In the *Nature Communications* paper, Bryan and colleagues took the same technique a step further. They took a liver, submerged it in a silica solution, and then heated it anaerobically to come up with a hardened, carbonized, exact duplicate of the liver, from centimeter to

nanometer scales.

"We let nature do the work," he says, "because we don't yet know how to build an object accurately across six length scales from centimeter to nanometers."

"Think about electrodes in batteries," he says. "That's a three-dimensional question. Now in livers and spleens, for example, evolution has already optimized absorption and diffusion in a three-dimensional organization. The liver is a marvelously effective organ with tremendous surface area for absorption and an unparalleled ability to release materials in channels ranging from large arteries to capillaries a few micrometers wide."

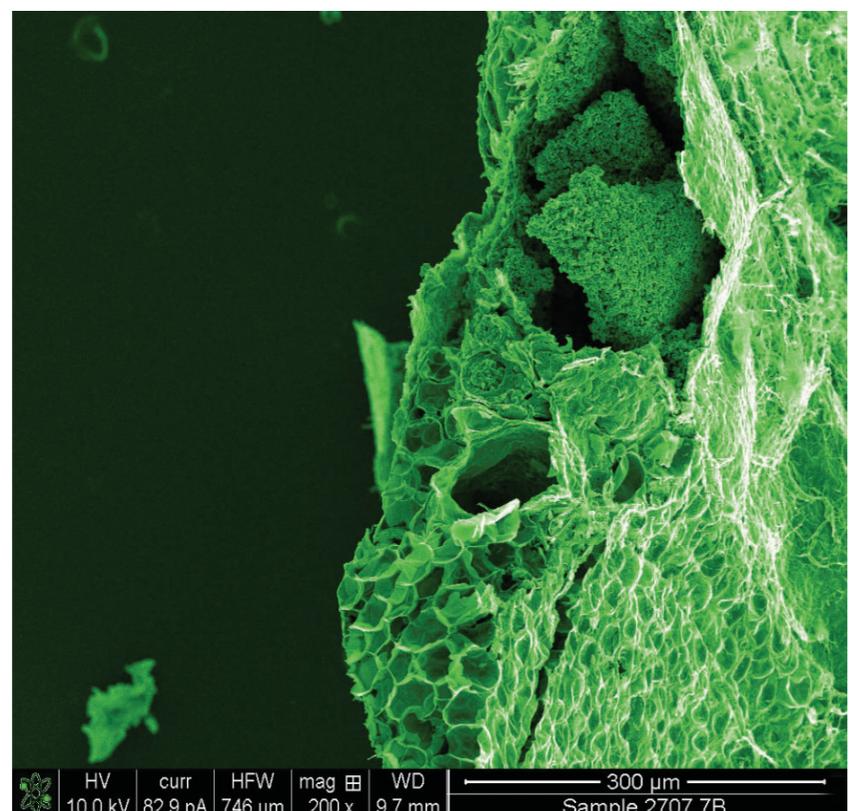
"If we transfer the hierarchical structure of a liver to an electrode, rather than having just a passive piece of solid material, the zombie result would have greater surface area per volume, greater energy storage, and have a creation that is already optimized to output fluids and small particles to much larger highways like large veins and arteries."

The carbonized method also can be used to better examine cancers and other growths without the often tedious and expensive processes normally necessary to "fix," process and stabilize the organic material for examination and prevent it from falling apart under electron-beam analysis. Carbon, because it conducts electricity instead of absorbing it, is not weakened and destroyed like protoplasm.

This creative consideration of the possibilities of the natural world in new and dizzying ways is in line with Bryan's research sponsor — DOE's Office of Science, which is interested, he says in "the exploration, discovery and design of biomimetic materials."

Portions of this work were performed at the Center for Integrated Nanotechnologies and DOE Office of Science user facility, jointly led by Los Alamos and Sandia National Laboratories.

Sandia and UNM have applied for a joint patent on the set of methods.



AN ELECTRON MICROSCOPE shows the heterogeneity of tissue available in a carbonized mouse spleen. (Image courtesy of Sandia National Laboratories)

For Executive VP Kim Sawyer, service to the nation is paramount



Note: Kim Sawyer signed on as Sandia's Deputy Labs Director and Executive VP for Mission Support four years ago. It's been a consequential time for Kim and for the Labs. Since she assumed her role at Sandia, Kim reorganized the Labs' Mission Support programs to bolster their effectiveness for supporting the evolving responsibilities of a 21st century government-owned, contractor-operated national laboratory. The restructure included: 1) elevating the CIO and IT services to a leadership position to oversee the critical areas of computing and network services and cyber security; 2) creating the positions of corporate risk officer and chief privacy officer to help safeguard Sandia and its employees; 3) strengthening corporate governance and assurance; 4) implementing greater efficiencies within Sandia's business operations; 5) controlling customer costs; and 6) applying cost savings toward mission delivery. Kim sat down recently to talk with the Lab News about some of the things she's thought about and has done since coming to Sandia, what motivates her, inspires her, and where she thinks the Labs may be going over the next two years.

Lab News: Thanks for sitting down with us, Kim. You've been here for four years now — has your Sandia experience measured up to your expectations?

Kim Sawyer: It's been a very rich experience. The first day I walked through the doors downstairs in Bldg. 800 it just felt like I was home. When I got on the elevator, I looked down and I saw the tile in the floor with the Sandia T-Bird emblem and the words that said "Exceptional Service in the National Interest" and I literally got goose bumps. It was just so impressive. I'd visited Sandia in the past, so I knew the Laboratories was involved in some incredible work, but it wasn't until I started work here that I came to realize just how broad and deep our capabilities are, how essential our mission is, how vital we are to the nation's security. It's been a constant education for me, a very fulfilling and exciting one.



LN: It sounds like Sandia's motto, "exceptional service in the national interest," resonates with you.

KS: It really does. I've been part of other institutions that had strong missions, but I think the mission here is just that notch above because of the fact that we're an FFRDC [federally funded research and development center]. We serve the nation, we're there when the nation calls, and that lends a different dimension for me.

LN: Seeing Sandia with fresh eyes, what has impressed you about the Laboratories?

KS: What struck me immediately was that we have great leadership and that people are genuinely interested and committed to the work that they are doing. I appreciated the fact that people were also open to looking at things from a new perspective. Even as recently as yesterday, we had a management review for Mission Support and the conversation was really rich in terms of what are the things that we could do better. How can we integrate to serve the Laboratories better? The open and honest communications and willingness to make ourselves vulnerable is something that I really appreciate because it helps us to grow.

LN: In the four years you've been here what do you see as the biggest successes, for you personally and for the Laboratories?

KS: I was present during the early discussions on the Strategic Plan, which I think has been a huge success for the Laboratories. It has helped us look at what we need to do through a different lens and I think it has helped people across the Laboratories to get a better sense of how they fit into the bigger picture.

In the nearer term, the most significant success over the past year has been the development of the mission areas framework. It tells a very rich and strong story about how and why we are relevant to the nation. From a Laboratories perspective, that has been a great success.

For me personally, what I've found most gratifying has been being part of a leadership team where we make strong contributions as individuals but as an integrated team our contributions are even stronger. Do you know the phrase "Forming, Storming, Norming, Performing?" Like any team, we've been through all those phases and today I feel very strongly that we are performing as an integrated team. I'm very proud of my teammates.

LN: What are the big opportunities we still have out there?

KS: I think our big opportunities are in the area of information technology, making sure we have the right tools in place to improve our ability to get the right information quickly and to get it consistently right every time. That will lead to us being able to make more informed decisions about everything pertaining to the Labs.

I think our other opportunity is continuing to develop our people. Mentoring is a valuable tool and as we bring new employees into the Laboratories, we need to make them feel a part of Sandia and its culture and its legacy.



We need to ensure that all our employees understand our mission and the value of our culture. And that allows us then to continue with the legacy that has made Sandia unique.

I would just add in that area, one of the things that I'm really proud of is the fact that Sandia has such a rich culture of giving. Our volunteers contribute literally tens of thousands of hours of their personal time in the community each year. And for decades, we've been the leading organization in the state in terms of what we contribute to the United Way. It looks like our contributions through our ECP program are going to top out at more than \$6 million again this year and a very substantial portion of that will go directly to United Way agencies. I am especially proud of the generosity of our retirees. Once a Sandian, always a Sandian. In my role as chair of the United Way of Central New Mexico board of directors, I can tell you that our culture of giving at Sandia makes a huge, huge difference in our community.

LN: We've had some changes in leadership over the past month or so. How do you think that's going to affect the Labs?

KS: Leadership changes occur and having strong leaders is important at any institution, but I think what's more important is the infrastructure in place so that we're not starting over when a new leader joins the team.

The Labs' leadership team focuses a lot of attention on talent management and ensuring that we're preparing our employees for the next step and new opportunities. I think it's important, too, to recognize that regardless of who serves in leadership roles, the 21st century is going to present us with new opportunities and challenges. So we need to draw on our expertise but also be willing and open to different outcomes. I might be getting ahead of myself but innovation is really a very strong tool in any kind of institution. And at Sandia we're known for innovation. As I look at the way in which we execute the various functions there's lots of opportunity for us to take advantage and innovate. Leadership will certainly play a role in that, and a mix of seasoned and new leaders is healthy in any organization.

LN: How do you predict Sandia will be different in the next few years?

KS: Over the next couple of years we'll continue to mature our thinking about our mission areas. Paul [Hormert] laid out the mission area framework last year and now, after several months of focused effort, we have the mission area strategies in place that will help us to prioritize what we need to do to deliver the maximum benefit to the nation.

Also, the current management & operating contract with NNSA expires in April 2016, with a possible one-year extension option. What's going to be important during that time is that we focus on our mission, service to the nation, and our employees.

(Continued on next page)

LN: The new mission area framework helps us be responsive to 21st century challenges. In your role as Sandia's lead for Mission Support, what are your goals in ensuring that we're ready for the future?

KS: My goal is to anticipate what might happen, to be in the position of having thought through some of the potential needs and be ready with services and solutions from the Mission Support side. Another way of saying that is that I have now become very committed to and interested in scenario planning.

LN: Could you give me an example of what that might look like?

KS: You remember when we were facing a potential government shutdown last year? It was a very fluid situation, to say the least. We needed to get a handle on things fast! My team worked with our systems studies and analysis group to do some scenario planning of what would, what could potentially happen. We were asking, "What are the things we need to think about for the employees, for the mission, for the infrastructure?" As a result, when we were in the midst of that very dynamic, volatile time we were able to think clearly, we were able to reach into some of the things that we talked about, and bring those forward. We were able to come up with new ideas because we went through that process. It convinced me that scenario planning is a very powerful tool, one that is going to be particularly useful in the next few years of rapid change. We need to be able to respond in a proactive way as opposed to a reactive way. That's my goal.

LN: I'm going to change gears a little with a simple question: Why do you do what you do? As opposed to maybe having gone into something totally different?

KS: It starts with the fact that I love challenges. I love what I do. I have taken risks along the way in my career. I've moved from a field I was very, very good in — it was like second nature to me — to a field where I had to continue to learn and stretch and grow. I decided that I wanted more challenge in my career. I want to understand why some organizations operate in one way and others operate in a different way and why that matters and how that contributes to success. I want to be able to help make

a difference. How do I leverage my experiences to help move organizations forward? To help ensure we're ready for the next set of challenges? To me, those questions are the source of my energy. So when I look back on my career, I probably would not have done it any differently.

LN: What inspires you?

KS: I'm inspired when I see people pursue their dreams, and develop and aspire to things that they probably never imagined they would do. I like to think that we're making a difference in the lives of future leaders and contributors at the Laboratories. That's what makes me happy. That inspires me every day.

LN: Anything else you want to add?

KS: When I first came on board we came up with what we called our Mission Support imperatives. And that evolved into the Mission Support operational strategy map. And there are a couple of key components in



SANDIA DEPUTY LABS DIRECTOR and Executive VP for Mission Support Kim Sawyer

both those pieces of work. One is that it's about our customers — I think it's really important that we continue to maintain that focus both for our internal and external customers. And it's about learning how to get to a positive outcome, which takes the ability to view the world through a different set of glasses or walk in different shoes.

The other thing I think is important is that we need to continue to focus on reducing bureaucracy. Over the years we added more bureaucracy into our procedures, mostly for what were at the time very sound reasons. But I think that we have to step back, we have to reevaluate and we really need to look at how we streamline and improve the cycle time it takes to do

things and reduce the burden that we put on our employees and managers. Of course, we want to make sure we never sacrifice on safety, security, quality, or ethics, but we must always look for ways we can do things more efficiently and effectively. That's what the nation expects of us and that's what we should expect of ourselves.

Administrative Professionals forum



ANNUAL ADMINISTRATIVE PROFESSIONAL FORUM — Welcoming administrative professionals to "Discover Youiversity" earlier this month were Jill Hruby, left photo, VP of Energy, Nonproliferation, and High-Consequence Security Div. 6000, and Kim Sawyer, right photo, Deputy Laborato-

ries Director and Executive Vice President for Mission Support. The half-day workshop focused on improving team relationships and conflict management. (Photos by Randy Montoya)

One benefit of a December professional development forum for administrative professionals was learning skills that can improve team relationships. The topic was fitting, because the event itself was an example of teamwork in action.

"A team of administrative professionals volunteered to coordinate and organize this forum, on top of their other duties, and did a great job of managing end-to-end details, from selecting the presenter to promoting the event to handling logistics," says Karen Gardner, director, Human Resources, and executive sponsor for the event.

The planning team included Kelli Collins (1000), executive assistant; Monica Lovato-Padilla (9000), executive assistant; Deborah Marchand (6000), executive assistant; Tiffany Bill (2500), senior management assistant; Kathleen Bowers (3500), senior management assistant; and Pauline Marquez (2100), senior management assistant.

Training support was provided by Shelby Green (3014) and Mia Logan (3521).

Approximately 180 administrative professionals attended one of the two sessions in New Mexico, and some 30 attended the forum in California. Overall feedback was positive.

"The facilitator had some great tips and tools for building effective teams and managing conflicts effectively," says Carol Eiffert (3600), senior management assistant. "It was great to have an opportunity to spend a few hours learning ways to be more effective both at work and home."

The session included information that can be readily applied to day-to-day work, including ways to deal with conflict and stressful situations and ways to improve team relationships.



Sandia turns on Sky Bridge supercomputer



By Neal Singer

Photos by Regina Valenzuela

A ribbon-cutting ceremony for the 600-teraflop Sky Bridge supercomputer, the most powerful institutional machine ever acquired by Sandia, will be held on Dec. 18.

Sky Bridge's new home at one time housed ASCI Red, the world's first teraflop computer. Technical advances have enabled Sky Bridge, with nearly 600 times the computational muscle, to draw only two-thirds the electrical power and require about half the space of its illustrious predecessor.

The efficiently water-cooled machine also should cost about 50 percent less to operate than comparable air-cooled machines, and will execute the newest computer programs well enough to "enable new solutions to difficult national security-related problems," says John Noe, manager of Scientific Computing Systems (9328).

Sky Bridge will increase Sandia's mission-computing capacity by nearly 40 percent, providing 259 million processor hours per year across its 1,848 nodes.

Sky Bridge was funded with \$10 million through the newly launched Institutional Computing program, which itself was created by an executive leadership decision to support large-scale computing as an ongoing Laboratories capability.

The machine is considered a capacity cluster, which means it can handle a broad range of small- to medium-size workloads while running multiple problems at the same time, says Steve Monk (9328).

"In dedicated access mode, it can be used to solve problems that require lots of compute capability, but that is not its normal operations model," Steve says.



COOL GUY — Dave Martinez (9324) shows off the new Sky Bridge installation. Dave is the Facilities project lead and is responsible for making sure the supercomputer gets power and cooling. He has been a key innovator for Sandia's corporate data centers and has enabled us the Labs to deploy new technologies in power and cooling in machines such as Sky Bridge.

One factor in the acquisition decision was the cost savings associated with the liquid-cooled system, says John. "The facilities cost for a hybrid liquid/air-cooled system was 50 percent of the cost of a completely air-cooled system, because the latter would have required many computer-room air conditioners. And it should be cheaper to run."

The liquid-cooling option also reduces noise to less-than-hazardous levels, meaning that operations personnel do not require hearing protection to service Sky Bridge.

Lest anyone think that Sandians would jubilate over unproven cost savings, "We have a unique opportunity to measure identical systems, one air-cooled in another computer and one hybrid liquid/air cooled (Sky Bridge) to determine the exact operating cost differences," says John.

Built by Cray Inc., Sky Bridge relies on the same generation of hardware found on the successful (though air-cooled) Tri-Lab Linux capacity cluster supercomputers installed at Sandia, Los Alamos, and Lawrence Livermore national laboratories.

Sandia's new Institutional Computing program also provides funds to augment traditional scientific computing platforms with specialized systems that perform well on informatics, graph analysis, big data searches, "emulytics," and other burgeoning problem areas. Emulytics is a Sandia-coined term indicating "the practice of using a powerful computer or network of computers to emulate a highly complex but unmanageable system in an attempt to gain knowledge about the behavior of the larger system," says John.

Sky Bridge should be available to Sandia HPC users in January.



HBE wins NOVA award for Health Action Plan programming

By Kristen Meub

The HBE Health Action Plan team in late October received a 2014 NOVA Award at a ceremony in Washington, D.C. Lockheed Martin presents the NOVA award to 50 individuals or teams from its 100,000-employee workforce across the corporation.

The award recognizes teams whose exceptional contributions are critically enabled by teamwork. To put this award in context, here's a brief overview of Sandia's health and wellness strategy and how the Health Action Plan program amplifies its design.

HBE has a multi-prong, systematic approach for its health and wellness programming, based on the following principles:

- Positively impacting the health and productivity of the workforce;
- Connecting HBE services to contemporary research and evidence-based strategies;
- Reducing healthcare costs by providing health plan programming focused on the best price and value for proven quality and service, and decreasing lifestyle risk and managing chronic diseases through wellness programming, case management, and disease management programs.

The three most important numbers in this strategy are the 8-15-80 model. The model stands for eight behaviors and risks that lead to 15 chronic conditions that account for 80 percent of healthcare spending nationwide.

8 Behaviors and Risks

- Poor stress management
- Smoking
- Physical inactivity
- Unhealthy diet
- Insufficient sleep
- Excessive alcohol consumption
- Poor standards of care and lack of health screenings

15 Chronic Conditions

- Diabetes
- Coronary artery disease
- Hypertension
- High cholesterol
- Back pain
- Obesity
- Cancer
- Asthma
- Arthritis
- Allergies
- Sinusitis
- Depression
- Congestive heart failure
- Lung Disease (COPD)
- Kidney disease

While HBE's health and wellness program has been in effect at Sandia since the 1980s, the past five years have introduced the core programming that Sandians will recognize today, including:

- Opening a corporate fitness facility in Bldg. 956 in 2010.
- Launching the Virgin Pulse program in 2011 — 74 percent of Sandians participate and average 8,610 steps daily.



MEMBERS OF THE HBE HEALTH ACTION PLAN team that won a 2014 Lockheed Martin NOVA Award include, front row, left to right, Laura Foreman, Kalina Jinzo, Johanna Grassham, Callie Lovato, Debra Sanchez, and Jessika Brown. Back row, left to right, Laine Goldman, Jennifer Perea, Jon Pier, Renee Holland, Peter Keegan, Amy Cincotta, and Lisa Teves.

- Offering a \$250 incentive for completing an online health assessment, starting in 2011.

• Launching the Health Action Plan program in 2013 based on aggregate data gathered from the online health assessments. The goal of the Health Action Plan program is to help employees address a specific health risk.

• In 2013, 29 percent of Sandians completed a Health Action Plan. As a whole, Sandians enrolled in Health Action Plans lost 1,880 pounds, saw an average 15-point decrease in blood pressure, a 33 point decrease in LDL cholesterol, improved sleeping habits, lowered tobacco use, and increased physical activity.

• In 2014, HBE expanded the Health Action Plan program to address disruptive conditions, wellness, and incorporate the Energy Hub model to promote short breaks designed to increase productivity and performance throughout the workday while relieving stress and breaking up long periods of sitting.

As a result, HBE concludes that its health and wellness programming has made an impact on lowering Sandia's medical costs.

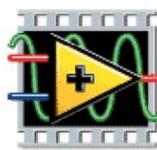
"We have been able to sustain lower benefits premium increases compared to the national average during the last five years by focusing on our health risks," says Health Benefits and Employee Services Center 3300 Director Rob Nelson. "The moral of the story is that the most important number in healthcare is 'one' — it's about you identifying just one risk and taking action to address it."



HBE HEALTH ACTION PLAN team rep Jenn Perea, right, pauses for a moment with Lockheed Martin President and CEO Marillyn Hewson during the NOVA Award ceremony in Washington, D.C.

Remember to take your health assessment before midnight (PST) on Dec. 30 (NOT Dec. 31) to earn \$250 for your 2015 Health Reimbursement Account (HRA). The health assessment will help you identify your individual health risks and suggest targets to work toward. Go to healthassessment.sandia.gov to get started today.

Sandia organizations recognized as LabVIEW Centers of Excellence



NATIONAL INSTRUMENTS

LabVIEW

Two Sandia organizations — Equipment Engineering Value Stream Dept. 2728 and Controls, Testers, and TM Comp Dept. 2668 — have been named National Instruments LabVIEW Centers of Excellence. Officials from National Instruments were at Sandia recently to present the certificates of recognition to the two groups.

LabVIEW is a system-design platform and visual programming development environment. At Sandia, LabVIEW is used primarily to control and sequence test equipment, collect data, and analyze results.

National Instruments, the maker of LabVIEW, introduced the Center of Excellence program to encourage and promote the development of software applications that are designed and built using high-quality methods and programming practices.

According to Dept. 2728 Manager Mark Allen, "Having LabVIEW Centers of Excellence within Sandia means that customers, both internal and external, can have a high level of confidence that the software developed by our groups does what it was designed to do, is of a high quality, and will be more robust to future requirements."

Mark says the two departments (2728 and 2668), have been working toward the Center of Excellence certification for more than a year and a half.

DEPT. 2660 SENIOR MANAGER Chui Fan Cheng, second from left, and Dept. 2728 Manager Mark Allen, second from right, show off their National Instruments Center of Excellence certificates following a recognition event at Sandia. They are joined by National Instruments officials Edward McConnell, left, Nancy Jones, and Conan McHugh.



More than 35,000 customers worldwide use the highly specialized LabVIEW software, of which only a select few attain Center of Excellence status. David Bonal, a National Instruments official who works closely with its Sandia customers, says the benefits of the COE program for Sandia include access to senior National Instruments engineers, invitations to consumer advisory boards, select forums, and additional

learning and development programs.

"This level of recognition is attained by demonstrating leadership in software engineering excellence that competes with others on a global scale," Bonal says. "National Instruments invests in these select organizations so that partnering together, we may drive innovation, standards, and lower the total cost of ownership in test and measurement."

Sandia team wins NNSA Sustainability Award

Sandia has won a Best in Class NNSA Sustainability Award in DOE's Innovation and Holistic Approach category. The award recognized the Org. 4144 Materials Sustainability & Pollution Prevention (MSP2) program's development of several data management systems designed to increase productivity for the MSP2 team and its customers.

The data systems have helped reduce paper use, boosted employee productivity and customer satisfaction, and reduced the need to drive to remote locations to verify and view inventory.

DOE's Sustainability Awards recognize exemplary individual and team performance in advancing sustainability objectives through innovative and effective programs and projects that increase energy, water, and fleet efficiency, and reduce greenhouse gases, pollution, and waste. The Innovation and Holistic Approach category recognizes methods and cross-disciplinary research at the site level that apply innovative ideas to tackle broad-based sustainability issues.

Environmental Programs and Waste Management Org. 4140 Senior Manager Fran Nimick says, "We're pleased our group won this Best in Class award on behalf of Sandia. The collaboration of the continuously innovative thinking of our MSP2 staff with IT professionals who focus on development of agile, customer-focused tools is proving to be exceptionally productive."

The MSP2 program funded the development of the data management systems using revenues from the site-wide recycling program, and according to Ralph Wrons, (4144) team leader for the MSP2 program, "We're fortunate to have been able to pay for these new databases and online request systems with recycling revenues; otherwise we would have been hard-pressed to get the funding to accomplish these improvements."

Below are brief descriptions of the new data systems and how they have enhanced Sandia's sustainability goals.

Solid Waste Collection & Recycle Center (SWCRC) online requests

For more than a decade, when employees needed waste or recycling support from the SWCRC (formerly the Solid Waste Transfer Facility), they would call a hotline number and describe their needs, which would be transcribed onto a form that would be picked up by the person or team that would act on it. Virtually no communication occurred with the customer after the initial request regardless of the outcome. That manually based system has been replaced with an online dynamic request form available on TechWeb at <https://info.sandia.gov/esh/swcrc/request.php> filled out by the customer. The highly efficient electronic process has led to a substantial reduction in paper use and freed SWCRC personnel to accomplish other work. The data system has significantly enhanced communication between SWCRC staff and its customer throughout the entire life-cycle of the request.

Microsoft SharePoint waste minimization library

In an innovative application of SharePoint capabilities, the MSP2 program developed a library of projects that demonstrate waste minimization. The SharePoint tool makes it easier to document evidence of efforts and results of hazardous waste minimization in laboratory processes, which is a Corporate Procedure requirement. Additionally, the tool has proved to be an excellent method for sharing waste minimization efforts and success stories and viewing those of others, to get ideas for applying lessons learned to an existing process. The categories are hazardous and non-hazardous solid waste, radioactive waste, chemicals reduced, energy conservation, water conservation, and other reductions. Topics in the library include capturing evaporated liquid helium for reuse, mercury waste eliminated, ethanol reuse, granulated activated carbon returned to manufacturer, waste diesel becomes fuel again, and machin-

The awarded team members include Sam McCord and Ralph Wrons (both 4144) from MSP2 and, from the IT side: Sean Naegle (9326), Debra Clifford (2913), Ben St. Clair (9543), Lynda Innis (9543), Charles Snider (9326), Chadwick Johnson (9326), Matthew Smith (9326), Jason Loyd (9326), and Gabe Arrillaga (9326).

ing coolant life extended and waste reduced.

Lead Bank web workflow

To make the Lead Bank program more accessible and efficient for its potential customers, the physical paperwork process was eliminated and the inventory was photographed and displayed online with a shopping cart. An online workflow was developed to gather only necessary information, with as much of that being auto-populated from the corporate databases as possible.

Automated emails are generated letting specific individuals know when they must do a task in the workflow. Reports are programmed to track the amount of lead distributed for re-use and taken in when no longer needed, and allow more efficient access to the data than previous hand tallying.

Solid Waste & Recycling Information Management System (SWRIMS)

As Sandia has diversified to an incredible number of material streams going to numerous destinations and vendors through different shipping methods, the ability to keep track of it all was insufficient in an aging spreadsheet. To improve data quality and gain work efficiencies, a custom inventory and shipping system was implemented.

This system has greatly sped the quarterly data reporting cycle by only needing to go to one source report for many data points where previously 10 or more different sources were queried and manually combined.

Sandia was one of five Best in Class winners announced in the NNSA complex and this nomination will next be considered for DOE agency-level Sustainability Awards.

Electric Car Challenge sparks students' STEM interest



STUDENTS from Vista Middle School cheer on their car.

By Valerie Larkin • Photos by Emily Aikins

Aspiring automotive engineers from 27 middle schools across New Mexico competed in the New Mexico Electric Car Challenge on Nov. 22 at Highland High School. More than 200 students and 46 teams participated in a race, a design competition, and an optional oral presentation.

The challenge was created to present science and math concepts to students in a fun and exciting way, encourage team building, stimulate creative thinking, and develop students' writing and presentation skills.

"This event introduces students to engineering careers. Students discover that, in engineering, there isn't just one right answer, and things don't always go as expected," says Amy Tapia, manager of Community Involvement Dept. 3652.

Sandia, Los Alamos National Laboratory (LANL), Public Service Company of New Mexico (PNM), Albuquerque Public Schools, Intel, Air Force Research Laboratory (AFRL), and Northrop Grum-

man Corp. sponsored the event.

At registration, teams received a lithium-ion battery and a direct-current motor they used to power their vehicles. The students also received a kit containing a chassis, wheels, and gears they were not required to use. The students were encouraged to experiment with different body styles and materials to improve their cars' performance on a 10-meter racetrack.

Volunteer judges evaluated the designs for innovation, craftsmanship, and appearance, and rated the students' oral presentations.

Katrina Groth, a reliability engineer in Risk and Reliability Analysis Dept. 623, judged the challenge for the third time. "The students start with the project toolkit, but I am looking for evidence that they have gone beyond that to make something bigger and better. I want to see that they've thought creatively and logically about how to improve what they started with," she says.

During the optional oral presentation, students spoke about the challenges faced in the design and marketing of battery-powered electric cars.

"We want the students to have done some research to understand how electric cars are related to our national interest, and to discuss what they learned from this process," says Katrina.

Krystal Irby, a science teacher at McKinley Middle School in Albuquerque, coached two teams in this year's challenge — five sixth- and seventh-graders, and six eighth-graders. Irby's teams worked on their electric cars twice a week after school. Each year she makes the challenge a priority because of the benefits to her students.

"I help them approach a challenge and discover



SANDIA'S COMMUNITY INVOLVEMENT organization thanks all the Sandia Serves Volunteers who helped with this year's challenge. Helping make this event possible were, left to right, Robert Abbott (1463), Andy Jameson (5339), Dominick Abbott, Jonathan Torres (5416), Katrina Groth (6231), Emily Aikins (3652), Rachel Colbert (2615), Jonathon Kwok (5563), and Joel Harms (5416). Not pictured: Grant Wells (0414), Robert Salazar (2669), Mark Ralph (6925), and Len Duda (5782).

things about themselves like new interests, undeveloped talents, and the capacity to solve a problem. After the competition, I see a rise in their self-confidence as they not only completed the project but raced it and presented its design. This is such an important opportunity for students at this age," she says.

The race involved five qualifying runs and a final head-to-head elimination tournament. Trophies were awarded in the race, design, and presentation categories, and overall winners also received cash awards.



PRACTICE, PRACTICE, PRACTICE — Before the race, students send their car down the track on a practice run.



AS PART OF THE ORAL COMPONENT of the challenge, students prepared props to augment their presentations.

Classified Ad deadline change. Due to the Holiday Shutdown, the deadline for the January 9, 2015 Lab News will be noon on Wednesday, Dec. 24.

Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

MISCELLANEOUS

DIAMOND TIRE CHAINS, truck/SUV, 2 pair, P215/75R15, never used, \$95; hot tub, seats 2, Jetsetter Hot Springs Spa, working condition, purchased in '00, \$500. Lorence, 237-1205.

ANTIQUe JUKEBOXES, private collection: 1946 Rockola; 1948 Wurlitzer; 1952 Seeburg; excellent condition, will need service call. Sena, 873-1665.

SPEAKERS, Definitive Technology, 2 BP10, 1 CLR2002, refurbished, will audition, \$400 firm. Murata, 228-6901.

STORM/SECURITY DOOR, Larson, white, 36" x 81", w/deadbolt, retractable screen, sliding window, trim/hardware, \$200 OBO. Eklund, 505-480-3503.

LUMINARIAS, UNM Band fraternity, \$10 first dozen, \$5 ea. additional dozen. Black, 505-515-9565.

BOOKCASE, wood, cherry stained, 48" x 48", excellent condition, photos available, \$50. Elmazi, 856-2197, ask for Nazim.

DINING TABLE, elegant, w/2 leaves, 8 hand-carved chairs, photos available, \$750. Outkin, 505-695-0356.

HEIRLOOM RING, women's, gold, diamond, sapphire, size 7, German-made, appraised at \$3,300, asking \$2,850. Peters, 505-294-0363.

FURNITURE; dining set, \$2,000; conference table, \$400; Vision Fitness stationary bike, \$400; all outstanding condition, photos available. Bauck, 994-0999.

WASHING MACHINE & DRYER, GE, 8 yrs. old, 3.7 cu. ft. top-load washer, \$300/both OBO. North, 715-7430.

TELESCOPE, Discovery Dobsonian, 10-in., F6, w/2-in. Crayford focuser, Telrad sight, 10mm Plossel eyepiece, \$700. Garrett, 270-7295.

DESK, black, hardwood, TEMA, 49-1/4"W x 21-1/4" D x 30"H, drawer 26" x 15", excellent condition, photo available, \$150. McDonald, 554-2048.

RECUmBENT BIKE, NordicTrack GX 4.7, excellent, \$280; Polti heavy-duty steam cleaner; Zager E-Z play, low-action guitar, exquisite, \$850. Caskey, 298-6428.

ELECTRIC MOBILE SCOOTER, 4-wheel, Rascal 600, all adjustable features, flat-free run tires, new \$2,150, asking \$750. Marchi, 346-4220.

DRUM SET, Royce, w/cymbals, \$200. Hooper, 281-2312.

SALON CHAIRS, 2, 1 new, 1 barely used, new \$550, will sell both for \$300; new toner, Brother Printers TN-210 (2 black, 2 cyan, 1 yellow, 1 magenta), \$250. Hunter, 363-8822.

DOBRO GUITAR, Beard Gold tone, square neck, 6-string, w/hard-shell case, like new, \$990. Gendreau, 268-3436.

FUTON, queen, tan hardwood frame, pad, sheets, blankets, excellent condition, \$200 OBO. Vook, 505-884-4754.

SOFA, French country, excellent condition, photos available, \$75. Elmazi, 856-2197, ask for Theckla.

HAWAII TIMESHARE, Honolulu, 1 wk/year, studio, \$500. Felix, 573-0595, ask for Sam.

TIRES, 2, Champiro VP1, P185/75R14, GT radials, <200 miles used, like new, \$75. Wimpy, 822-0223.

How to submit classified ads
DEADLINE: Friday noon before week of publication unless changed by holiday. Submit by one of these methods:
 • EMAIL: Michelle Fleming (classads@sandia.gov)
 • FAX: 844-0645
 • MAIL: MS 1468 (Dept. 3651)
 • INTERNAL WEB: On internal web homepage, click on News Center, then on Lab News link, and then on the very top of Lab News homepage "Submit a Classified Ad." If you have questions, call Michelle at 844-4902. Because of space constraints, ads will be printed on a first-come basis.

- Ad rules**
1. Limit 18 words, including last name and home phone (If you include a web or e-mail address, it will count as two or three words, depending on length of the address.)
 2. Include organization and full name with the ad submission.
 3. Submit ad in writing. No phone-ins.
 4. Type or print ad legibly; use accepted abbreviations.
 5. One ad per issue.
 6. We will not run the same ad more than twice.
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 8. No commercial ads.
 9. For active Sandia members of the workforce, retired Sandians, and DOE employees.
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 11. Work Wanted ads limited to student-aged children of employees.
 12. We reserve the right not to publish any ad that may be considered offensive or in bad taste.

TRANSPORTATION

'81 CORVETTE STINGRAY, dependable, beautiful, not original miles, no major issues, small items to address, \$8,000. Santos, 269-3461.

'01 VW NEW BEETLE, turbo, manual, silver, leather seats, sunroof, CD changer, 85K miles, \$4,000 OBO. Crossno, 505-280-2184.

'05 SUBARU FORESTER, 1 owner, manual transmission, red, 74K miles, new tires, great condition, \$7,000. Stewart, 505-206-7066, ask for Jim.

'06 TOYOTA HIGHLANDER, 4-cyl., 2WD, 95K miles, new Michelins, 1 owner, all service records, \$9,000. Stoffels, 505-228-5523.

'03 PORSCHE 911 C4S, 83K miles, excellent condition, \$27,900 OBO. Lyle, 505-331-8374.

'88 CAMARO IROC-Z, V8, manual, red, 173K miles, clean, plus many parts, Craigslist 4780348439, \$5,900 OBO. Kuehner, 856-952-2872.

'04 FORD F250 LARIAT, crew cab, 4x4, 6.0L diesel, 5-spd. auto, mint condition, 192K miles, \$15,500 OBO. Farmer, 505-228-3595.

'01 PONTIAC GRAND AM, AT, PW, PL, AC, 30-mpg, fair condition, good tires/brakes, great student car, \$1,000 firm. Cocain, 281-2282.

'04 PONTIAC GRAND PRIX GTP, supercharged, loaded, heated seats, heads-up display, well-maintained, 100K miles, \$7,000 OBO. Musgrove, 505-814-4122.

'06 SUBARU TRIBECA LIMITED, 3rd row, navigation, new tires & brakes, 108K miles, good condition, \$12,000. Retunski, 505-480-2865.

RECREATION

MOUNTAIN BIKES: Trek Singletrack 950, blue, \$275; specialized Hardrock, black, \$200; both excellent condition. Klavetter, 299-4299.

REAL ESTATE

4-BDR. HOME, 3 baths, 4,280-sq. ft., separate in-law quarters, swimming pool, <http://albuquerque.craigslist.org/real-estate/4746762279.html>, \$419,900, \$429,900 w/realtor. Ramos, 505-220-5201.

DUPLEX, can live for free, good investment, located in retirement area of NM, call/email for more info. Pimentel, 505-823-2934, pimental555@msn.com.

'00 PACE ARROW MOTOR HOME, 37-ft., 2 slides, lots of power for towing, stored inside, \$39,000 OBO. Hibray, 821-3455.

3.15 ACRES, south 14 (Hwy 337), utilities, well water, 15 mins. to Albuquerque, 80 Edelweiss, MLS#82146. Fisk, 505-459-5099.

WANTED

ROOMMATE(S), 7 mins. to Sandia, no pets, \$400/mo., utilities & Wi-Fi included, Guillen, 505-385-8189.

LOVING HOME, male kitten, Maine Coon, good w/dogs, very affectionate, indoor, litter trained. Tapia, 250-1111.

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Crossing the country on two wheels

By Patti Koning

4,344 miles, 11 states, 2 countries, 4 national parks, 12 rivers, and 7 mountain passes — all by bicycle. Last summer, Kevin Schroder (8137) fulfilled a personal dream when he cycled from Bar Harbor, Maine, to Anacortes, Wash., in 86 days.

“For years, on weekend bike rides or riding into work, I fantasized about biking across the country,” Kevin says. “The experience was amazing, simply life-changing.”

In early 2013, Kevin and a college friend promised to ride across the country together in the summer of 2014. An avid cyclist since he moved to California 30 years ago, Kevin bikes to and from work most days (20 miles round-trip) and rides up to 50 miles on the weekends. In the months leading up to the trip, he added an additional 100–150 miles of weekly riding.

The friends first considered making their own way via a shorter southern route. When those plans fell through, they signed onto a trip with the Adventure Cycling Association.

“That was a great decision; they did an incredible job leading the trip,” Kevin says. Each day, one Adventure Cycling guide rode sweep on the daily 30–90 mile ride while the other drove the van, made camping reservations, and shopped for the evening meal. The cyclists cooked on their own and slept in tents 76 of the 85 nights on the trip. Kevin says he became more comfortable in a tent than in a hotel room.

The cross-country trip had many highlights, big and small. “Glacier National Park stands out in my mind,” says Kevin. “The experience of riding over Logan Pass on Going-to-the-Sun Road and crossing the Continental Divide was simply stunning.”

The Badlands area of North Dakota in Theodore Roosevelt National Park was another surprise. “I expected nothing but prairie between the Minnesota/North Dakota state line and Glacier National Park,” says Kevin. “But it was incredibly beautiful.”

The ride traversed the 11 states that form the US border with Canada — Maine, New Hampshire, Vermont, New York, Michigan, Wisconsin, Minnesota, North Dakota, Montana, Idaho, and Washington. The cyclists crossed into Ontario, Canada, at Niagara Falls, following the north shore of Lake Erie to reach the upper



KEVIN CELEBRATES his coast-to-coast bike ride with a dip in the Pacific Ocean at Anacortes, Wash.



part of the ride. That honor belongs to the rain.

“We rode 75 miles in cold pouring rain along the Koochanusa Reservoir [in northern Montana],” recalls Kevin. “That was the hardest day of the trip. I’ll take a mountain pass any day over riding in nonstop rain.”

Keeping clean, dry clothes was another challenge. “When you woke up in the morning, there was often dew on everything, so you’d pack up your stuff wet. There wasn’t always time for your clothes to dry that afternoon. And we were always doing laundry, mostly by hand in a sink,” says Kevin. “But most of the time, the weather was spectacular.”

Another challenge Kevin faced, completely separate from the physical toil, was stringing together enough leave for the trip. “I didn’t want to take a leave of absence, so I had to be resourceful,” he says.

He first turned to vacation hours, saving the maximum (240), purchasing 44, borrowing 40, and factoring in his accrual during the trip. Adding in flextime



KEVIN WITH SANDIA RETIREE Karen Scott, who joined him for several days at the beginning and end of his 86-day marathon bike ride from Maine to Washington state.

“The entire trip was like a dream. Every night when I go to sleep, I dream a movie of the places we rode through. This experience also gave me lots of ideas for retirement.”

— Kevin Schroder

peninsula of Michigan.

Each day, the group rode for about four to six hours, leaving them many hours to spend in small towns along the route. “When we rolled into these small towns as a group, we attracted a lot of attention,” says Kevin. “Everyone wanted to talk to us. I really enjoyed those conversations with the locals.”

Coffee and pastries every day

Another benefit of riding so many miles a day — you can eat as much as you want. “We’d start at a coffee shop with pastries and finish the day in the next town’s ice cream shop,” he says. “That’s one way to mark the trip — by the coffee shops.”

When he reflects on the trip, Kevin also marks it by the rivers they crossed — Penobscot, Hudson, Erie Canal, Niagara, St. Clair, St. Croix, Mississippi, Red River of the North, Missouri (twice), Yellowstone, Flathead, Columbia — and the mountain passes — Kancamagus Pass, Middlebury Gap, Logan Pass, Sherman Pass, Wauconda Pass, Loup Loup Pass, and Washington Pass. But the mountain passes were not the toughest



and holiday hours still left him short, so Kevin reduced his work schedule to 35 hours per week for the duration of his trip.

“The entire trip was like a dream,” he says. “Every night when I go to sleep, I dream a movie of the places we rode through. This experience also gave me lots of ideas for retirement.”

Kevin has already set his sights on the next big ride: the Great Divide Mountain Bike Route — 2,765 miles from Banff, Alberta, Canada, to Antelope Wells, N.M.

