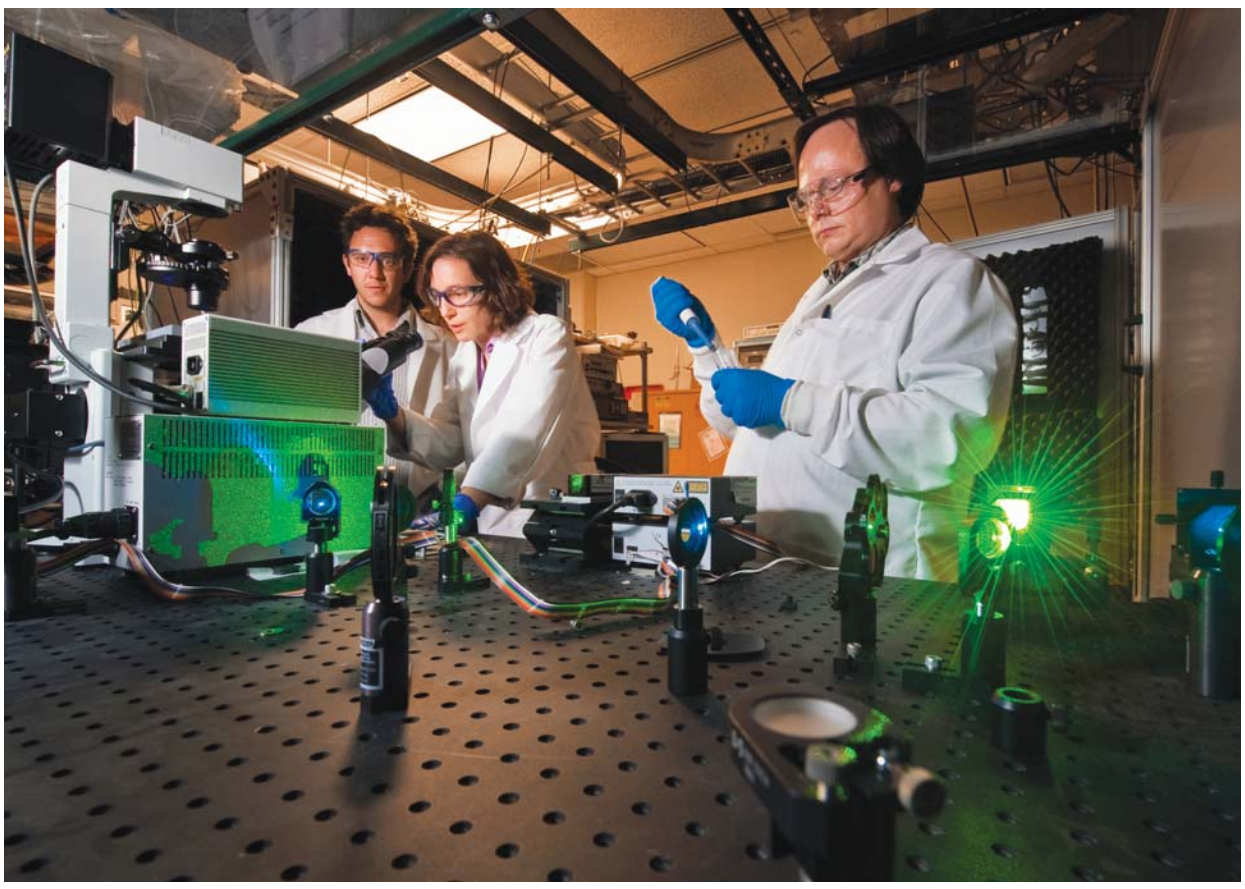
Sandia researchers unlock secrets of plague with stunning new imaging techniques



By Stephanie Hobby

It all starts with the breach of a single cell. Viruses, bacteria, and other maladies-in-waiting skulk around the body, waiting for a chance to strike. Once they slip past the immune system's defenses, they start ferociously multiplying, preparing to unleash havoc on an unsuspecting host.

Exactly how and why the cell's defenses fail against some invaders while successfully fending off others has long been a mystery. A novel super-resolution microscopy technique developed at Sandia is providing new answers to old questions by unveiling never-before-seen detail of the cell membrane. The insights gleaned from the research could open doors to new diagnostics, prevention, and treatment techniques. The research supports Sandia's biological threat reduction programs and could be expanded to support biofuels research.

"We're trying to do molecular biology with a microscope, but to do that, we must be able to look at things on a molecular scale," says Jesse Aaron (8622), a postdoctoral appointee.

The cell membrane is a bustling hub of activity on a miniscule scale. While providing structure and housing the cell's interior, the membrane regulates movement of materials in and out of the cell, controls adhesion to

(Continued on page 4)

IMAGING BREAKTHROUGH — Jesse Aaron, left, Jeri Timlin, and Bryan Carson (all 8622) in their laboratory working with new imaging techniques to view cell-level activity with unprecedented detail. (Photo by Randy Montoya)

Stimulus funds at work in the Battery Abuse Testing Laboratory

By Stephanie Hobby

Sandia's Battery Abuse Testing Laboratory is a center of mayhem and destruction on a good day, and it's about to get even better. The nation's go-to center for battery testing was built in 1991, and since then has conducted critical scientific studies to evaluate the safety of thousands of batteries, including 12 years of testing for the FreedomCAR program and the US Advanced Battery Consortium. The one-of-a-kind facility analyzes performance under any number of abuse scenarios batteries might face in the real world, and it's getting a $4.2 million renovation. The overhaul will further the lab's capabilities as part of a national stimulus package to develop low-cost batter-

"This will bring our capabilities up to the point where we can test larger batteries that are going to be relevant to the electric vehicle market."
— Chris Orendorff

(Continued on page 5)

Sandia LabNews

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Sandia National Laboratories

Sandia researchers put a new spin on radiation biodosimetry

By Patti Koning

What if a nuclear reactor melted down, exposing the nearby population to dangerous levels of radiation? That scenario has been on everyone's mind since Japan's devastating 9.0 earthquake and subsequent tsunami crippled the Fukushima Daiichi nuclear plant.

"The trouble with radiation sickness is that the symptoms are often latent and don't appear for days, weeks, or even months," says Greg Sommer (8621). "But data clearly shows that if you can start treatment within the first 24 hours of exposure, the prognosis for recovery goes up significantly."

Radiation exposure leaves a clear signature in a victim's blood, but reading that signature is time- and labor-intensive, far outside the scope of an emergency response. For the past year and a half, Greg has been working on a Laboratory Directed Research and Development (LDRD) project to create a handheld radiation biodosimetry device to answer that need.

"In a mass exposure, you can't rely on hospitals and clinics for screening because demand will quickly overwhelm their capacity," he says. "The goal is to put a drop of blood into the device without any pretreatment — it could come straight from someone's finger — and have an answer about their level of exposure within 15 minutes. Then you can target therapeutics to the people who really need them."

The original LDRD project set out to develop a portable device to rapidly screen blood for a panel of protein biomarkers, leveraging Sandia's expertise in point-of-care clinical diagnostics and protein screening. That scope changed after Greg began working with colleagues at the Armed Forces Radiobiology Research Institute (AFRRI), a DoD laboratory, who have developed the panel through 30 years of research on radiation signatures in blood using animal models.

"They asked us to bring in a hematology component to do a white blood cell count," he says. "A good white blood cell count combined with the protein measurement yields a very accurate dose assessment. This threw a monkey wrench into our project, but it's a worthy challenge. Point-of-care hematology is a powerful tool."

ULRICH SCHAFF (8621) prepares the "lab-on-a-disk" radiation biodosimeter to run immunoassay experiments while Greg Sommer (8621) monitors the assay control and records data. The two hope to begin validating their data against established benchtop methods this summer. (Photo by Dino Vournas)

(Continued on page 3)

Inside

and . . .

That's that

I see where the Coronado Club is about to come down once and for all. When Sandia decided to abandon the club a few years ago, I had always thought that as long as the building still stood and the facilities were intact, there was a chance it might open again. Never happened. And now, with the building being demolished, the pool being filled in, and the whole site leveled, denial or wishful thinking's no longer an option.

I'd like to say that the demise of the beloved C-Club leaves me with a bittersweet feeling, but sometimes it just feels bitter: After all, I recall with deep affection the many happy hours I spent there, lounging around the pool with my family, literally watching my kids grow up, graduating from the kiddie pool to the big pool to the diving board. I treasure the memories of interacting with fellow Sandians, bonding not just person-to-person but family-to-family. Knowing each other in contexts beyond the laboratory or office space seem to forge bonds of friendship and affection that are stronger than those forged in the workplace alone.

There was this, too, about the C-Club: Retirees could meet with old colleagues for lunch, continuing to impart their wisdom and insights long after they were off the payroll. How many tough technical problems, I wonder, were solved at the Coronado Club over a bowl of its best-in-town green chile stew? Plenty, I'd bet. How many Sandians, sitting under those big cottonwoods on a hot summer weekend watching their kids learn to swim, thought, this is a great outfit to work for? Plenty, I'd bet.

If a place can be imbued with a spirit, the Coronado Club was brimming full with the spirit of Sandia.

There were plenty of reasons — compelling and legitimate reasons — cited for closing the C-Club in 2004. It would have cost at least $5 million to restore it; membership had declined precipitously in recent years (only 10 percent of eligible employees and retirees belonged to the club); base access had become problematic in the wake of 9/11. There were plenty of reasons for closing the club, but I felt then and still believe (for what it's worth) that with some investment of money and imagination, with some outside-the-box thinking, the club could have been made relevant for a whole new generation of Sandians and their families. With the closing of the C-Club five years ago, the Sandia community took a hit right to the heart. And now, with its final demise, I think Sandia has been diminished.

* * *

What was it T.S. Eliot said? April is the cruelest month? He wasn't talking about the annual swamp cooler hookup ritual we go through here in New Mexico, but he might as well have been. I call it swamp cooler roulette; I just played . . . and lost. You know how it goes: You get a couple of really balmy days in mid-April and you wrestle around with whether you should hook up the cooler.

That means, for most of us, shutting down the central furnace and putting it in campaign mode. It's one of those almost irrevocable steps, one that can't be reversed without a bunch of hassles. So as the temperatures in mid-April hit the low 80s here in Albuquerque (and feeling 10 degrees warmer indoors), I experienced, up there on my roof ministering to the swamp cooler, that sense of virtuousness you get when you're maybe just a step or two ahead of the crowd. And I felt a little surge of smug satisfaction — I was way ahead of the neighbors this year! — as I flipped on the switch and started feeling that cool, moist air flow into rooms that had been shut up tight all winter long.

I'll bet you know where the rest of this story goes; you've maybe, probably, been there, butting up against an immutable law of nature: The day after you disconnect your central furnace and hook up your swamp cooler, the weather goes south . . . or north. Anyway, it gets cold. And there's a corollary to this law: The weekend after you plant all those beautiful tomato plants, you will, guaranteed, get a hard frost.

See you next time.

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

Sandia technology to be on display at TVC's Equity Capital Symposium

Seven Sandians and several former Labs employees will introduce their technologies to investors from across the country in hopes of convincing them to help fund startups to commercialize their ideas at a Technology Ventures Corporation (TVC) event this month.

The 18th annual Technology Ventures Equity Capital Symposium will be held May 18-19 at the Embassy Suites Hotel & Conference Center in Albuquerque.

Four Sandia projects will be highlighted at an investor-only reception May18. The presenters and their projects are: Shawn Dirk (1821), Photopatternable Conducting Polymers; Kent Pfeifer and Arthur Rumpf (both 1716) and Walter Gill (1532), Passive Wireless Sensors for Harsh Environments; Milton Vernon (1385), The Right-Sized Reactor; and George Wang and Qiming Li (both 1126), Microsphere-Templated Growth and Liftoff of Reduced Defect Density GaN.

On May 19, three startups with ties to the Labs will be presented at the symposium. Former Sandia employees Paul Davis, president of EnviroLogic Inc., and Matt Channon, chief technology officer at Silichem LLC, will talk about their startups. Joseph Accetta, CEO of JSA Photonics LLC, will discuss his company, which uses technology that came from Sandia, according to TVC.

Out-of-town private equity investors attending the two-day symposium also will tour Sandia on May 18.

TVC, a nonprofit charitable foundation funded by Lockheed Martin and DOE to commercialize technologies and create jobs, has raised $1.18 billion in equity investment, created more than 13,500 jobs, and helped launch 114 companies since its inception in 1993.

For further information about the symposium, call Michelle Mang at (505) 843-4110 or register online at www.techventures.org.

— Heather Clark

Recent Patents

Note: Patents listed here include the names of active and retired Sandians only; former Sandians and non-Sandia inventors are not included. Following the listing for each patent is a patent number, which is searchable at the US Patent and Trademark Office website (www.uspto.gov).

* * *

Juan-Carlos Jakaboski (5944), Steven Todd (5437), and Stephen Polisar (4144): Dual Initiation Strip Charge Apparatus and Methods for Making and Implementing the Same. Patent No. 7,908,970.

Katherine Simonson (5535): Image Registration With Uncertainty. Patent No. 7,912,321.

Kurt Wessendorf (1732): Dual-Range Linearized Transimpedance Amplifier System. Patent No. 7,825,735.

Peter Schwindt, Grant Biedermann, Matthew Blain, Daniel Stick (all 1725), Darwin Serkland (1742), and Roy Olsson III (1749): Microfabricated Ion Frequency Standard. Patent No. 7,859,350.

Richard Jepsen (6122), Neil Davie (1534), Douglas Vangoethem (1526) and Edward Romero (1534): Using Piezo-Electric Material to Simulate a Vibration Environment. Patent No. 7,851,973.

Murat Okandan (1749) and Peter Schwindt (1725): Tuned Optical Cavity Magnetometer. Patent No. 7,826,065.

Chad Staiger (6124), Mark Vaughn (6916), and A. Keith Miller (1523): Hybrid Membrane-PSA System for Separating Oxygen from Air. Patent No. 7,875,101.

Steven Highland (6634): Vehicle Assisted Harpoon Breaching Tool. Patent No. 7,887,092.

Andrew Allermand, Daniel Koleske (both 1126), Mary Crawford, and Stephen Lee (both 1123): Aluminum Nitride Transitional Layer for Reducing Dislocation Density and Cracking of Aigan Epitaxial Films. Patent No. 7,915,626.

Alex Robinson (1749), Philip Rodacy (2555), Ronald Manginell, Matthew Moorman, and Robert Simonson (all 1716): Microfabricated Field Calibration Assembly for Analytical Instruments. Patent No. 7,913,534.

Michael Hibbs and Cy Fujimoto (both 6124): Poly(Phenylene)-Based Anion Exchange Membrane. Patent No. 7,888,397.

Dennis Youchison (1658): Porous Nuclear Fuel Element for High-Temperature Gas-Cooled Nuclear Reactions. Patent No. 7,889,146.

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Biodosimetry

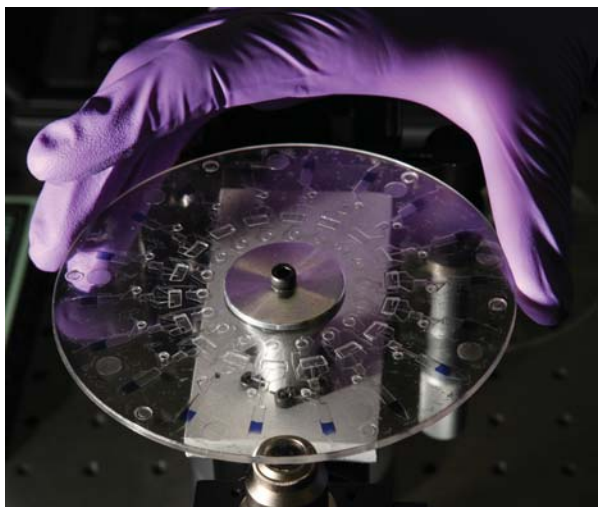
(Continued from page 1)

Meeting two daunting challenges — adapting hematology to a portable format and then combining methods for protein detection and white blood cell counting onto a single device — required a whole new approach, something quite different from the standard microfluidics-based lab-on-a-chip used in many of Sandia's portable diagnostic tools. The answer to both challenges, it turns out, was centrifugal force.

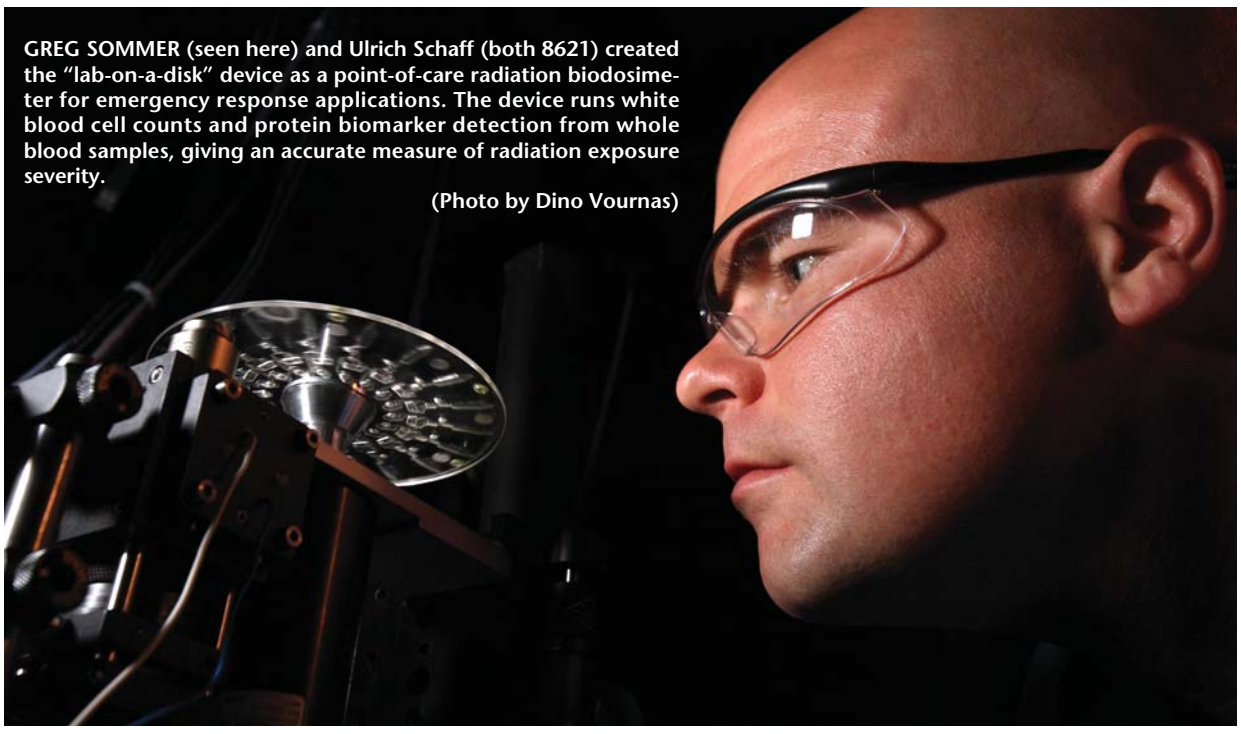
Postdoc Ulrich Schaff (8621), who did his doctoral research at a University of California, Davis lab studying inflammation and white blood cells, turned to the concept of lab-on-a-disk, which uses the centrifugal force generated by a spinning disk to manipulate a sample.

"The idea was to put a preparatory centrifuge in the device to do blood counts directly from the separation technique," Ulrich says. "We've combined operations that you really can only do on a disk. If you just try to miniaturize benchtop preparation methods, you wind up with a very complex network of channels and storage containers. Using separation principles for these steps greatly simplifies the design."

The lab-on-a-disk prototype that Greg and Ulrich developed is deceptively simple, in that it hides their meticulous work developing disk-based assays and the mechanics of the disk itself. First the sample, a drop of blood, is routed to the center of the disk, which is then spun slowly to enable capillary action to route the sample through channels into different assay regions. The sample is mixed with pellets to capture the proteins and fluorescent tags that enable identification. A faster spin of the disk sends the different samples to the bottom of the channels for analysis.



LAB-ON-A-DISK enables point-of-care radiation dosimetry.



GREG SOMMER (seen here) and Ulrich Schaff (both 8621) created the "lab-on-a-disk" device as a point-of-care radiation biodosimeter for emergency response applications. The device runs white blood cell counts and protein biomarker detection from whole blood samples, giving an accurate measure of radiation exposure severity.

(Photo by Dino Vournas)

The beauty of the device, says Greg, is that it is simple and ubiquitous.

"All you need to run the disk is a motor and a laser, both found in any CD player," he says.

That simplicity was quite clear as they developed the disk using a Dremel tool as a motor and a hairdryer to simulate a heating element. They read the results under a microscope, a step that will be automated using a laser to produce a digital readout.

Ulrich and Greg published initial results in *Clinical Chemistry* (Vol 57, Issue 5, pp 753-761, 2011) demonstrating protein separation using the lab-on-a-disk. A follow-up publication is planned to show that the device can also perform white blood cell counts.

They now are using DoD blood samples to validate the device's analytics against "gold standard" benchtop methods. The team hopes that getting the lab-on-a-disk radiation biodosimeter into the field won't be difficult, given its overall simplicity.

"The system is being designed to run on existing infrastructure, so there wouldn't be the typical barriers of capital investment or training," says Greg. "With the hematology component, this device also has potential for applications far beyond radiation biodosimetry, such as biodefense, emerging infectious diseases, cancer, and HIV treatment and research."

Sandia CaliforniaNews

Japanese collaboration promises to put Sandia hydrogen program on global track

By Mike Janes

PRESSURE PLAY — Brian Somerday (8222) loads a hydrogen pressure vessel into a laboratory furnace. (Photo by Dino Vournas)

A new hydrogen research initiative based in Japan has begun to have an impact at Sandia's California site and will likely become the first project to be rolled into a broader laboratory research umbrella aimed at increasing Sandia's hydrogen partnerships domestically and abroad.

Brian Somerday (8222) is playing a lead role with the International Institute for Carbon-Neutral Energy Research (I²CNER, pronounced "icener"), one of six research institutes that comprise the World Premier International Research Center Initiative (WPI) established by Japan's minister of Education, Sports, Culture, Science, and Technology. WPI provides support for R&D projects and encourages international collaboration among leading researchers. It is designed to encourage the development of R&D centers to attract leading scientists from around the world and advance high-caliber work.

Brian serves as lead principal investigator for I²CNER's hydrogen structural materials research area. For Sandia, I²CNER represents a concrete opportunity to engage the international community on hydrogen-related research even more ambitiously than it has in the past.

Though Sandia's hydrogen program has interacted with non-US collaborators previously to address individual technical activities and information sharing, says Daniel Dedrick (8367), leadership in the I²CNER initiative provides an oppor-

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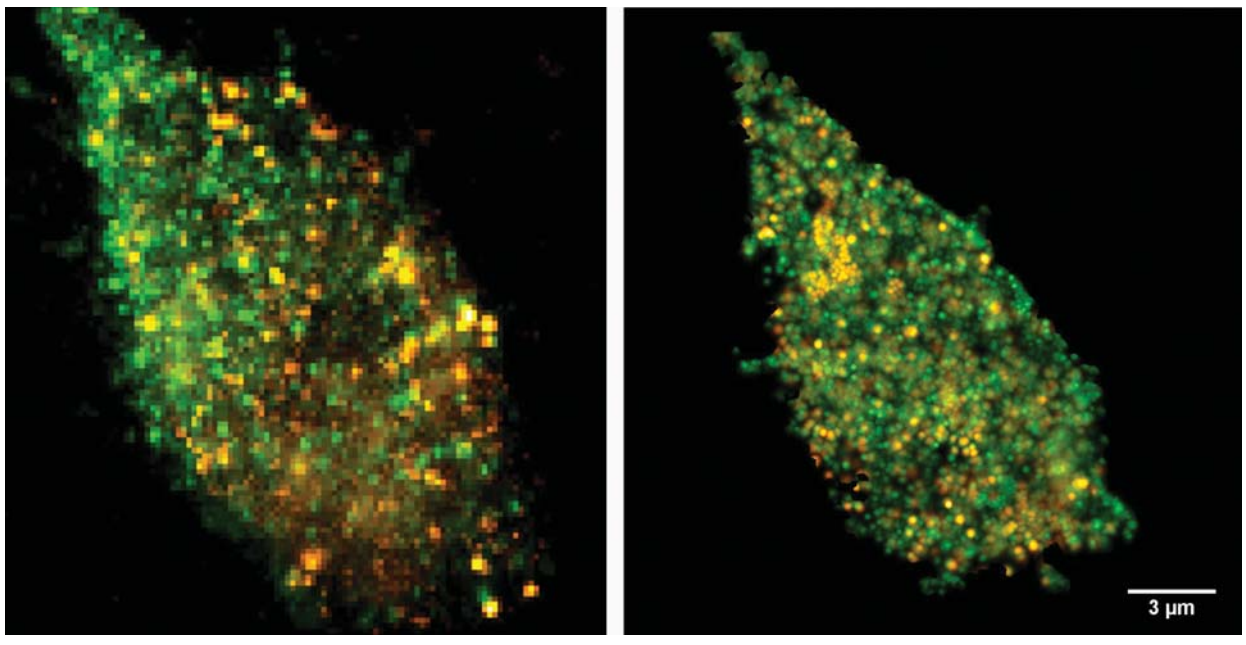


SUPER RESOLUTION MICROSCOPY — The difference between what was previously seen on the cell surface (left image) is dramatically different from what Jeri Timlin, Jesse Aaron, and Bryan Carson (all 8622) are now able to image. Orange areas correspond to the bacterial lipopolysaccharide (LPS), derived from *E. coli*, and the green areas correspond to the cell's TLR4 receptors.

Imaging the cell

(Continued from page 1)

other objects, and coordinates the cell's communications and subsequent actions through signaling. Receptor proteins on the surface of immune cells, known as Toll-like receptors (TLRs), are tasked with recognizing intruders, or antigens. The TLR4 member of this receptor family responds to certain types of bacteria by detecting lipopolysaccharides (LPS) present on their surface. They subsequently initiate signaling to alert the cell and activate an immune response.

A vexing problem

Using imaging techniques they developed, Jesse, Jeri Timlin (8622), and Bryan Carson (8622) discovered that TLR4 proteins cluster in the membrane when confronted with LPS derived from *E.coli,* which increases cell signaling and response. Interestingly, LPS derived from the bacteria that causes plague, *Yersinia pestis*, do not cause the same effects. This finding, which marked the first time such small events could be imaged and compared, could explain why some pathogens are able to thwart the human immune system.

Being able to image the cell surface with high enough resolution to see the earliest binding events has been a vexing problem, since even the most sophisticated optical microscopes are bound by the diffraction barrier, which limits what can be resolved using visible light.

"With more traditional visualization methods, you can't see the level of detail you need. It's important to look at not only what's present, but also when and where it's present in the cell," says Jeri.

Dual color capabilities

The technique used by Jeri and Jesse builds on super-resolution capabilities developed in recent years, but goes another step by adding dual-color capabilities to the relatively new stochastic optical reconstruction microscopy, or STORM. The combination enables the Sandia team to get an exponentially better picture by simultaneously imaging LPS and TLR4 receptors on the membrane.

"Current capabilities are akin to looking out the window of an airplane and seeing the irrigation circles. You know that plants are there, but you can't tell what kinds of plants they are or what shape the leaves are," says Bryan, a Sandia immunologist who was an integral part of the project. "But with this technology, it's like zooming in and seeing the leaves and the structure of the plants. That buys you a lot in terms of understanding the mechanism."

The NIH awarded Jeri a five-year, $300,000 per year grant in 2009 to develop such visualization power, and it has exciting potential for future applications. Next on the agenda is developing the capability to image live cells in real time using spectral stimulated emission depletion, or STED, technology.

"We're working toward using a version of superresolution that's much more live-cell friendly, and extend that in terms of what colors are available to do multiple colors, but still maintain the live-cell friendliness. I see this as a beginning of a long development in this type of imaging technology," Jeri says.

The eventual goals will likely expand as the technology reveals additional surprising capabilities. Eventually, the Sandia team would like to be able to visualize protein/protein interactions.

Seeing the whole biological process

"Every biological process that goes on in your body is somehow controlled by proteins forming complexes with other proteins or complexes in the membrane, so this would give you this ability to look, with high spatial resolution and multiplexed color capabilities, at four or more things in a living cell, which can't be done very easily right now. It can be done in pieces, but we want to see the whole biological process," Jeri says.

The technology has exciting potential in immunology and drug discovery as well, Bryan says.

"We're hoping to do something like label the viral particles and watch them in real time, or as close as we can to real time, in the internalization process," he says. "With the super-resolution technique, we can actually watch them move through the membrane and see if there are other structures being recruited by the virus to the site of internalization. That will hopefully give us mechanistic insight into how a given virus enters a cell. Understanding that mechanism can lend itself to identifying drugs or other compounds that might block viral entry."

The team is interested in expanding the technology's capabilities to research other areas such as biofuels to better understand where and when different pigments are located on the membrane of oil-producing algae. This would provide valuable insight into their photosynthesis functions, which could help in more efficient biofuel production.

"A lot of this work is still pretty initial, but we're encouraged by what we're seeing and excited for future potential," Jesse says.

Hydrogen

(Continued from preceding page)

tunity to coordinate with international experts to address big, complex problems.

One of the primary goals of the WPI, says Brian, is to reform the research university environment in Japan by fostering more direct collaborations with non-Japanese entities. Consequently, I²CNER — though based at Kyushu University in Japan — is unique in that its director is professor Petros Sofronis of the University of Illinois, a long-time collaborator of Sandia's. Sofronis has most recently been conducting hydrogen embrittlement research and development at the University of Illinois, funded by DOE's Office of Energy Efficiency and Renewable Energy (EERE).

Japanese researchers to Sandia/California

In addition, Brian has already developed a number of research contacts in Japan and is planning to attend an I²CNER program review there in June. He and Daniel are preparing to welcome Japanese researchers to Sandia's California site as part of the I²CNER collaborative process.

I²CNER's research goals, Brian says, strongly overlap with Sandia's interests. The institute's technical areas include (in addition to the structural materials area that Brian leads) hydrogen production, fuel cells, thermophysical properties, hydrogen storage materials, and carbon capture and storage.

In the meantime, Daniel is working with EERE to develop the Research, Engineering and Applications Center for Hydrogen (REACH) at Sandia/California, a project that would house I²CNER and other specific hydrogen research activities.

A focus on engineering and applications

REACH, when it comes to fruition, will include three primary components. One will be to perform as an international R&D center for hydrogen, an objective supported by DOE since global collaborations are key to solving difficult problems in hydrogen. Secondly, REACH will feature a materials thrust, with a focus on new structural materials and predictive simulation. Finally, REACH will focus on engineering and applications, such as the award-winning fuel cell mobile lighting technology (*Lab News*, April 9, 2010).

In the wake of the recently completed DOE Metal Hydrides Center of Excellence led by Sandia (*Lab News*, May 14, 2004), the new REACH effort exemplifies continued hydrogen science and technology leadership at Sandia. Brian's work with I²CNER dovetails perfectly with the long-term REACH vision, Daniel points out.

THE INTERNATIONAL INSTITUTE for Carbon Neutral Energy Research (I²CNER) held a kickoff symposium earlier this year at Kyushu University in Fukuoka, Japan. The attendees were predominantly participants in the I²CNER project, representing the two primary institutions in I²CNER (Kyushu University and the University of Illinois) as well as universities and national labs (including Sandia) from the US and Europe.

New facilities, eventually

"Our first goal with REACH is to have physical space within Sandia/California's open campus, and we envision that REACH and I²CNER will work together within that space, such as hosting I²CNER researchers, co-organizing workshops on future trends, and other activities," says Daniel.

Eventually, Daniel says he hopes that REACH's longer-term program development efforts will pay off and lead to new facilities on the Livermore Valley Open Campus.

"Fortunately, we have a good network of collaborators and potential funding sources already identified, with some of them even knocking on our doors ready to go down the research path with us," says Daniel. "So this is a great opportunity to develop those relationships even more and turn ideas into real programs."

BATLab upgrade

(Continued from page 1)

ies for electric and plug-in hybrid electric vehicles. The funds are being used to update test bays, data acquisition systems, and laboratory space, and additional staff members have been hired to meet the growing demand for Sandia's battery safety expertise.

"This will bring our capabilities up to the point where we can test larger batteries that are going to be relevant to the electric vehicle market, and move up to batteries that will be used in plug-in hybrid electric vehicles," says Chris Orendorff (2546), team lead for the Battery Abuse Testing Lab. "We'll have the capability to test batteries in the 5- to 15-kilowatt-hour range, which we've never done before. This scale of testing is critical to the deployment of electric vehicles that are needed to reduce the nation's dependence on foreign oil."

Developing capabilities in clean energy

During a visit to Sandia in November 2009, Deputy Secretary of Energy Daniel Poneman announced the Battery Abuse Testing Lab funding as part of a $104.7 million stimulus package. The goal of the package is to further develop the nation's efforts in clean energy and efficient

DARREL HANCOCK, left, and Kyle Bond of J.B. Henderson, are members of the nearly 50-person construction team responsible for implementing the upgrades. (Photo by Randy Montoya)

technologies across seven DOE national labs. Sandia's portion is paying for much-needed upgrades while supporting several new lab positions and sustaining about 50 construction, architectural, and engineering jobs.

"This has been a great way to do our part in putting people in the community to work and keep them working," says Charles Tomlin (4827), construction manager for the project. "We've worked with 11 architects and engineers and about 30 to 40 construction contractors and vendors, and we expect to be done with construction three months ahead of schedule."

The upgrades include an X-ray computerized tomography system that will generate 3-D images to allow researchers to conduct failure analysis without doing physical analysis, which can be destructive. The lab's battery calorimetry capabilities will be the world's largest and will include six accelerating rate calorimeters (ARCs), three isothermal battery calorimeters, one microcalorimeter, and one differential scanning calorimeter, all of which will be consolidated and housed in the new facility. New spectrometers and laser diagnostics for gas measurements, upgrades to the scrubber system, and additional battery cyclers, supporting higher-energy batteries, are also on the lab's roster of new equipment.

A MAN, A PLAN — Chris Orendorff, team lead for the Battery Abuse Testing Lab, looks over plans for the BATLab remodeling project. He says the streamlined bays and new additions will greatly increase the lab's capabilities and throughput. (Photo by Randy Montoya)

"Chris and his team are already internationally recognized for their work. The recapitalization will allow us to sustain that leadership position in battery safety research and continue to develop new diagnostic techniques that are needed by domestic automotive manufacturers and their battery suppliers," says Tom Wunsch (2546), manager of Sandia's battery research efforts.

Need for upgrades readily apparent

Being the nation's leading battery abuse testing center for the past two decades has taken its toll. Inside the 2,000-pound blast doors, the need for upgrades is readily apparent. The test bays bear witness to the years of battery abuse testing, which can result in smoke, fires, and violent decomposition events. Much of the equipment is original and needs to be modernized and upgraded to meet the nation's growing energy storage needs.

The remodeled bays are completely stripped clean, coated in an epoxy paint to make clean-up easier, with new explosion-proof lights and a new CO_2 fire suppression system that can be manually or automatically engaged to quickly bring any large fires under control.

"In addition to the fire suppression system, we have moved all of the live power out of the test bays, except for the temporary power required for any given test. This allows us to safely cut power to the unit [being tested] should safety concerns warrant," says Bill Averill (2546), who oversees day-to-day operations of the lab while providing technical battery testing support.

New data acquisition systems will ensure a much more precise readout of results. The new systems will also help with efficiency, reducing set-up time by as much as a day, which lab leaders say will increase throughput by a factor of six. "The bays will be hard-wired and ready to go, so we can bring in batteries, connect them to the testers, and start testing," says Chris. "We can also run two tests simultaneously, which we've never been able to do before. These kinds of streamlined test capabilities will help expand our customer base, increase throughput for the lab, and will enable us to provide more support for industry."

Because much of the battery lab's testing is done for external clients, the area outside the control room will have two new 42-inch monitors so visitors can watch the test from outside the control area.

American jobs, American equipment

Although the lab is unmistakably a construction zone, testing is still being conducted in half the lab while the other half is overhauled. Construction crews are there from early morning until the early afternoon, at which time the laboratory team sets up and conducts tests.

Construction started during the 2010 winter shutdown, with completion scheduled for September 2012, but the work will likely be complete in June 2011, and Chris anticipates that the lab will be fully operational by March 2012.

"Because these are Recovery Act funds, we realize the importance of trying to get this spent on American jobs and American equipment. We are doing everything we can to get that done as quickly and responsibly as possible," Chris says. About half of the equipment funds were spent within six months of beginning the project. "Getting this money out into the economy is one of the DOE's priorities, and we've worked pretty hard to do that."

New bulbs illuminate unlikely safety problem

By Adriana Gronager

Working with a broom in a closet shouldn't be an accident waiting to happen. But more than one custodian has learned otherwise, the hard and sharp way.

Here's why: It turns out that when custodians are working in small custodial closets with long-handled tools, such as mops and brooms, there is a potential for serious injury.

A LIGHT TOUCH — Sandia lighting specialist Don Kerekes (4842) installs a safety bulb in a custodial closet in Bldg. 811. (Photo by Randy Montoya)

A SAFETY BULB, like the one here, contains a break within a plastic sheath, preventing glass shards from causing a safety hazard. (Photo by Randy Montoya)

If, when extending a handle to wring out a mop or adjust tools on a cart, for example, the handle extends high enough, it could shatter the light bulb located on the ceiling above, showering the custodian with shards of glass.

Don Kerekes (4842) and his low voltage replacement team have been addressing the problem for some time now, working throughout the Laboratories to replace the current fluorescent bulbs with safety bulbs that can capture broken glass inside the bulb unit itself.

The safety bulbs are covered with a protective coating that helps capture and contain glass particles if they break, greatly reducing the chance of injury. There's a cost associated with creating a safer work environment — the four-foot safety bulb costs substantially more than the standard four-foot fluorescent bulb. The safety benefit though, is priceless.

By installing these new safety bulbs, Don says he hopes to illuminate the safety hazards posed by standard bulbs.

"I don't want to see anybody get hurt with fragments falling into their eyes; that is my biggest concern," he says.

To get current bulbs replaced with the new safety bulbs, call Telecon at 844-4571.

Take Our Daughters & Sons to Work Day

Photos by Randy Montoya

More than 1,000 kids — children, family, and friends of Sandians in grades 5-12 — attended Take Our Daughters & Sons to Work Day at Sandia's New Mexico site this year.

Every division at Sandia/New Mexico hosted special activities for visitors that highlighted the Labs' research capabilities and the support services that enable the mission work. Among the highlights: demonstrations of solid-state lighting technology; environmental testing capabilities; 3-D virtual reality simulations; radiation detection; radio frequency demonstrations; tours and demonstrations at the Cooperative Monitoring Center and the National Solar Thermal Test Facility; explorations of Sandia's supercomputing capabilities; activities throughout the day at the Steve Schiff Auditorium and Hardin Field; and more.

In the photos here, clockwise from top, kids make ice cream using liquid nitrogen (Div. 2000); watch a target array being configured for Sandia's Z machine (Div. 1000); observe a weapon shape being prepared for shipping (Div. 10000); and watch a packaging demonstration to learn how Sandia protects important components during the shipping process (Div. 10000).

Sandia/California hosted its own Take Our Daughters & Sons to Work Day, also on April 28.

60 pounds and counting

— Ann Quam's weight-loss saga continues

By Iris Aboytes

ANN QUAM goes for a run in her neighborhood in the South Valley. (Photo courtesy of Ann Quam)

To understand Ann Quam's (5944) motivation to be physically fit, go back to 2008. At a family get-together, diabetes was a topic of discussion. Ann's mother and all her cousins, aunts and uncles have diabetes.

Ann had noticed that while walking from the bus stop to Bldg. 810 she was getting winded. She had mentioned this to her cousin Kathy, who works for the diabetes prevention program in Zuni. Kathy encouraged her to get checked.

Ann got a wake-up call when she had a blood test at Medical. Her results were a series of red flags, including the one that said she was obese. She was also prediabetic.

"That really scared me," says Ann. "I was determined to get rid of the red flags. I saw firsthand how my loved ones were dealing with diabetes. Besides, I have two children. I was concerned about their health, so I accepted the help HBE [Health, Benefits and Employee Services] offered.

"I saw a nutritionist and began logging my food intake. I learned how to make good food choices. I bought groceries that were fat-free and low in calories. Both my daughters were very supportive. They ate what I cooked. It is interesting to know that when I went on a couple of trips, I expected my daughters to go out and get fast food, but instead they cooked healthy foods at home."

Ann began walking around Hardin Field. She started by walking two laps. "They were the hardest two laps," says Ann. "By the time I finished my shins were hurting, but I did not give up."

After a while, Ann was walking three or four times around Hardin and began jogging. In September, she participated in her first 5K run.

After six months, Ann went back to Medical. This time her test results put a smile on her face. They were all normal. "I was on my way," says Ann. "I began seeing progress. I was losing weight. I did not feel tired, and I felt better about myself."

"It is my pleasure to brag about Ann," says fitness trainer Amy Cincotta (3334). "Ann has dramatically improved her health and physiologic measures over the past years. She has improved her blood pressure, body mass index, body fat level, aerobic fitness level, blood lipid profile, and attitude. She has lost about 60 pounds, 30 pounds a year. Many of my peers also work with Ann and we feel she is one of our greatest success stories. We are all so proud of her commitment to better health through consistent, positive behavior change."

Ann began and continues to take classes at HBE.

"The experts at HBE are wonderful," says Ann. "They did not pressure me, but gave me lots of encouragement. It was hard in the beginning, but once I started making progress, there was no stopping me. There have been times when my weight loss would plateau and I would become discouraged. When I asked the experts, 'Nothing to worry about,' they said. I was gaining muscle.

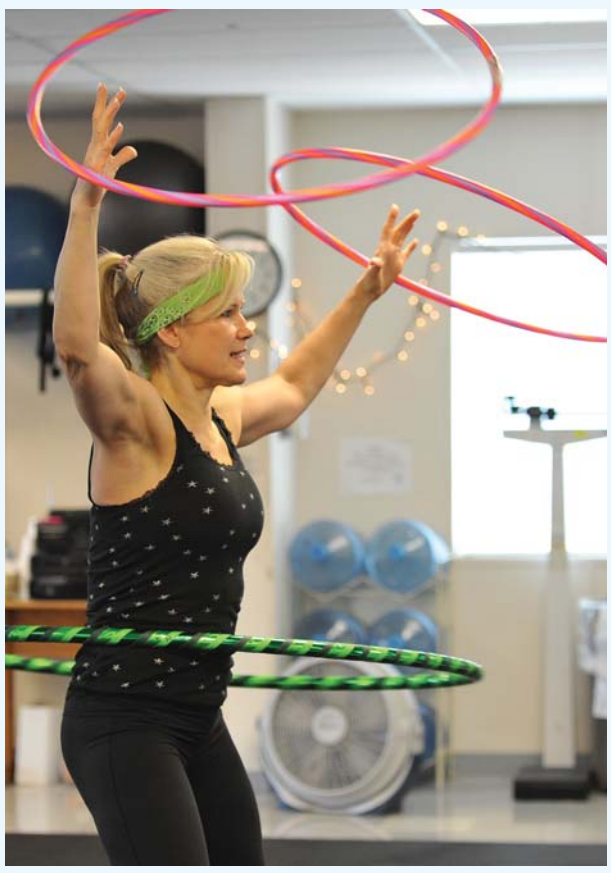
"Gone are fast foods, potatoes, fried foods, and fry bread. Here to stay are turkey burgers, spinach and salads, lots of salads. Now 5K races are becoming routine. My goal is to participate in a 10K.

"I feel better about myself. I have more energy. My daughters have to keep up with me. It is amazing how far along you can come when you have determination and a trained expert showing you the way.

"If anyone is in the prediabetes stage, don't give up — it can be prevented. Accept the help HBE is offering. If I did it, you can too."

New Mexico May 18 and California May 25

Fun with Function: Employee Health and Fitness Day



AMY CINCOTTA (3334) leads a Hoop to the Core class. (Photo by Randy Montoya)

By Iris Aboytes

Health, Benefits, and Employee Services (HBE) will hold its annual Employee Health and Fitness Day in New Mexico on May 18 between 11 a.m. and 1 p.m. and in Livermore, Calif., on May 25 between 11 a.m. and 2 p.m. This year's theme is Fitness Made Fun and will include the grand opening of the new Corporate Fitness Facility in Bldg. 956. All fitness events will be held at the Corporate Fitness Facility and around the track outside Bldg. 956. Join HBE/New Mexico's professionals for a "Fun with Function" circuit and then head inside for the grand opening of the facility. For a list of May offerings in New Mexico go to http://tiny.sandia.gov/eje9h. For California activities go to http://tiny.sandia.gov/2p9c3.

HBE has invited members of the Virgin HealthMiles Incentive Management Program to join the New Mexico Corporate Fitness Facility. Beginning in May, the facility will continue to invite the remainder of the workforce. Requirements to use the facility include completion of a HBE PAR-Q (Physical Activity Readiness Questionnaire at http://tiny.sandia.gov/uhla9) and the Health Assessment at https://healthassessment.sandia.gov. The facility offers a variety of cardio and resistance training equipment perfect for a lunchtime or after-work workout.

In addition, HBE's Preventive Health Program has a staff of certified exercise professionals who offer a variety of group fitness activity classes in MO 307.

Some of the classes include Hoop to the Core, a low- to no-impact effective aerobic activity focusing on waist trimming, core defining, and fluid movement. Additional benefits of hooping include development of core strength, balance, coordination, and flexibility.

Pilates is a mind/body form of exercise that focuses on the body's core (abs, lower back, and pelvic floor muscles.) Pilates is yoga-based, and assists in reducing physical and mental stress, while improving quality of movement, enhancing posture, improving core strength, reducing lower-back pain, and increasing muscle flexibility. The beginning class is appropriate for all fitness levels and modifications are offered for the advanced class.

Sports conditioning is a 45-minute super-circuit class involving varying intensities. This class yields both muscular performance and cardiovascular benefits. This class can be modified for varying levels. For a schedule of classes go to: http://tiny.sandia.gov/00abb.

Did you know?

- Fifty percent of eligible population — 4,799 individuals — participate in Virgin HealthMiles.
- These individuals have earned a total of 10,346,420 HealthMiles, which is an average of 2,155 per person.

"That means that half of the eligible population are making a conscious effort to be healthy and in the process earn extra deductible money for next year."

— Renee Holland (3334)