



Diamond triple-point and formerly unseen carbon state determined by team of Sandia researchers

Simulations and Z machine results to aid NIF fusion efforts, Neptune astrophysicists.

By Neal Singer

It's not immediately obvious why accelerating a projectile about the size of a stick of gum to 25 times the speed of a rifle bullet and smashing it into a target in central New Mexico would say anything about the state of diamonds on Neptune.

Or about efforts to produce nuclear fusion at Lawrence Livermore National Laboratory's National Ignition Facility in California.

It does because the Sandia work — reported in the Dec. 19 issue of the journal *Science* — provides data 10 times more accurate than ever before achieved of the pressures needed to change diamond into a state of slush and then to a completely liquid state.

On the way, as a bonus to science and to the researchers — Marcus Knudson (1646), Mike Desjarlais (1640), and Daniel Dolan (1646) — a triple point was discovered at which solid diamond, liquid carbon, and a long-theorized but never before confirmed state of solid carbon called bc8 were found to exist together.

Accurate knowledge of these changes of state — changes similar to those undergone by ice as it melts into water, but under much more extreme conditions — are essential in simulating behaviors of celestial bodies.

On Neptune, for example, much of the atmosphere is composed of methane (CH₄). Under high temperatures and pressures, methane decomposes, liberating its carbon. One question for astrophysicists in theorizing the planet's characteristics is knowing the form that carbon takes in the planet's interior. At what precise pressure does simple carbon form diamond? Is the pressure eventually great enough to liquefy the diamond, or form bc8, a solid that has yet other characteristics?

"Liquid carbon is electrically conductive at these pressures, which means it affects

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MARCUS KNUDSON examines the focal point of his team's effort to characterize materials at extremely high pressures. The fortress-like box sitting atop its support will hold within it a so-called "flyer plate" that — at speeds far faster than a rifle bullet — will smash into multiple targets inserted in the two circular holes. An extensive network of tiny sensors and computers will reveal information on shock wave transmission, mass movement, plate velocity, and other factors. (Photo by Randy Montoya)

Sandia Corp. approves leadership changes



The Sandia Corp. Board of Directors has approved changes in the Labs leadership team. Under the approved changes, Joan Woodard, left, Paul Hommert, and Al Romig will all assume new responsibilities. See the story on page 2.

Labs' job restructure process continues but completion date extended

Confluence of factors contributed to extension

By John German

Sandia's job restructure project is forging ahead but with one major change: The timeline has been extended so that completion is planned for April 2010 rather than the original deadline of summer 2009 (see "Why a new job structure?" on page 5).

The extra time gives the project team, managers, and employees an extra annual performance cycle before the changes are implemented. It also will ensure that design tradeoffs the team is working on can be resolved so the final structure works well for everyone who will become part of it.

In addition, implementing the project a year later and in concert with a major HR software upgrade will conserve time and money at a time when Sandia's budget is fraught with challenges, such as the expected need to contribute millions to the pension fund in the coming years.

Despite the schedule extension, HR & Communications Div. 3000 VP John Slipke cautions that difficult work must continue. "Our original schedule was very aggressive. It is still aggressive. We will need to keep working hard so we get a compensation system that is right for Sandia," he says.

Confluence of factors

Several considerations led to the decision to
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Just one of several 60th anniversary events

Save the date: May 16 set for first Family Day open house at Sandia/New Mexico in a decade

By Rod Geer

Yes, we all know that sunny spring weekend days can be busy, but here's one activity you won't want to miss. Family Day open house for the Labs' Albuquerque site is set for Saturday, May 16, 9 a.m.-3 p.m.

The event is open to members of the workforce (MOW): Sandia employees and contract personnel who are subject to the Sandia Business Rules through the terms of their contract. As has been the case for past open house events, members of the workforce will be able to invite and carefully escort a small number of guests consisting of family and close friends at the event.

However, current restrictions will require that retirees, unless they have a Sandia badge and fit within the MOW definition, participate as guests of a badged employee or contractor.

Planning is still in an early stage; however, an open house consistent with employee feedback received in a recent *Lab News Interactive* survey is on the drawing board. (See results of that survey at www-irm.sandia.gov/newscenter/interactive/index.php/pollsarchive.)

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Graphic by Steve Pope, Sandia Creative Group



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That's that

There's been a lot of talk – and even a *Lab News* story in the last issue – about our new austerity efforts, about the need to save money wherever we can, with that money going to help shore up the Sandia pension fund. That fund, just like your 401(k), has been hit hard by the recession and the stock market's sharp turn to the south. Sandia actually has a legal obligation to infuse money into the fund under the current circumstances.

It seems to me that we shouldn't view this austerity push as a short-term response to our particular situation. Rather, I think that we, as a national laboratory, ought to embrace a spartan ethic as a matter of principle. Let us impress with our work, in other words, and not with our trappings.

* * *

This next item falls into the category of too good a story not to pass along. Clyde Layne, who works out of our Washington office in the area of system and technology assessment, read our recent story about Robert Oppenheimer's car with more than a little interest. Turns out Clyde has a rather intimate connection with another Oppie car, not the stretched Packard the National Atomic Museum acquired and is restoring. Writes Clyde:

"The article . . . reminded me of my own brief brush with history and Oppenheimer's (other) car. In college I was only vaguely aware of who Robert Oppenheimer was until the morning our physics professor burst into tears before the classroom and told us of Oppenheimer's death the day before [Oppenheimer died in 1967]. Our professor had been working with Oppenheimer and was devoted to him.

"A year or so later, I advertised for a house-sitting job so I could work during the summer at the physics lab. I received two offers, one from Kitty Oppenheimer, Robert's widow. I met with her and was dazzled by the Oppenheimer home on the grounds of the Institute for Advanced Study in Princeton, N.J., but the other house-sitting job included access to a car. I decided, with difficulty, to 'give' the Oppenheimer house to a friend who was also working at the lab that summer.

"Because I didn't have immediate access to 'my' house, I intended to spend the first night after the dorms closed at the Oppenheimer house. I went there to wait for my friend to arrive and let me in, but he was out partying until the wee hours. After standing around feeling very conspicuous, I eventually opened the door to the ancient black car in the carport and went to sleep there, avoiding questions from the frequent police patrols through the grounds of the Institute. So, while I never met him, and missed out on caring for his house, at least I got to spend a night in Oppenheimer's car, probably the one I've seen pictured in the history books. I value even these little brushes with fame."

A great story, no?

* * *

In doing a bit of research about Oppenheimer, I was struck by something: How young these guys were who headed up the Manhattan Project. Oppenheimer was 38 when Leslie Groves in 1942 tapped him to lead the atom bomb effort. Edward Teller was 34. Hans Bethe, 36, and Enrico Fermi at 41 was the old man of the group. And that reminded me of a comment from Gene Kranz in the Discovery Channel series about the US space program called "When We Left Earth." Kranz was the flight controller immortalized in the movie *Apollo 13*. In "When We Left Earth," Kranz observed that in the early days of the space program, he was the old man in mission control – this when he was in his late 20s and early 30s.

So what does this have to do with us? With Sandia? Only this: In our current austerity push, it's important that we make sure we keep the pipeline open and flowing, that researchers at the beginning of their careers can find a place here. Their contributions (see the Manhattan Project and the Apollo program) can be enormous.

See you next time.

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

Leadership changes at Sandia

Changes focus on some key areas central to Sandia's future mission

The Sandia Corp. Board of Directors on Jan. 28 approved changes to Sandia's executive leadership team. In an announcement to Labs staff, Tom Hunter said the changes are intended to structure Sandia's executive team in such a way that directly addresses new directions related to the Labs' broad national security mission.

Al Romig will serve as Executive VP and deputy director for Laboratory Transformation & Operations. In this role he will focus on a number of internal challenges that require the attention of a dedicated chief operating officer.

Joan Woodard, who has headed Sandia's nuclear weapons program, transitions to EVP and deputy director for the Integrated Technologies & Systems (ITS) Strategic Management Group (SMG). She will lead several critical initiatives, including corporate strategies for energy, cyber security, the future of science and technology, and "all things nuclear."

Joan also will oversee the development of Sandia's strategy to address the changes associated with the transition to the Obama administration and new DOE leadership. She will assume responsibilities for the Mission Execution policy area and for nuclear weapons independent assessment.



JOAN WOODARD

Paul Hommert assumes the role of EVP and deputy director for the Nuclear Weapons SMG. Previously Paul served as VP for Sandia's California laboratory and head of the Homeland Security & Defense SMU.

As the newest member of the executive leadership team, Paul brings a diverse background of weapons-related leadership experience. He joined Sandia in 1976. From 1995 to 1999 he was director of Engineering Sciences, where he led engineering research efforts and was responsible for establishing Sandia's program in engineering simulation development as part of the NNSA strategic computing initiative.



PAUL HOMMERT

From 2000 to 2003 Paul was director of research and applied science at the Atomic Weapons Establishment in the UK. From 2003 to 2006, prior to his return to Sandia, he led the Applied Physics Division (X Division) at Los Alamos National Laboratory.

As EVP for the nuclear weapons program, Paul will retain responsibilities for the California laboratory until at least mid-summer when more leadership changes are expected.

Recent Patents

Note: Patents listed here include the names of active 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).

* * *

Michael Daly (12340), James Novak (5395), and Steven Rohde (5337): Geophysics-Based Method of Locating a Stationary Earth Object. Patent No. 7,376,507

Alfredo Morales, Linda Domeier, Pat Keifer (all 8223), and Terry Garino (1816): Method for Providing a Compliant Cantilevered Micromold. Patent No. 7,465,419

John Roskovensky (5713): Opaque Cloud Detection. Patent No. 7,480,052

Kevin Pedretti (1400): Distributed Processor Allocation for Launching Applications in a Massively Connected Processors Complex. Patent No. 7,454,595

Mark Ackerman (5928): Full Spectrum Optical Safeguard. Patent No. 7,460,247

Richard Ormshesher (5354) and Robert Axline (5747): Removing Interfering Clutter Associated with Radar Pulses that an Airborne Radar Receives from a Radar Transponder. Patent No. 7,460,059

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Take Note

Retiring and not seen in the *Lab News* pictures: Jonathan W. Cashwell (9547), 28 years; Mark C. Kalin (10267), 15 years; Glen M. Pino (9338), 25 years; Kevin D. Murphy (1031), 34 years; Mary Alice Padilla (9343), 27 years; Richard L. Padilla (4133), 43 years; Ralph G. Tissot (1822), 23 years; Vicky Vivian (5098), 31 years; and Anita M. West (12346), 15 years.

Next issue of Sandia Lab News highlights Labs' accomplishments



The next issue of the *Lab News* will be the annual Labs Accomplishments issue. It will be distributed beginning sometime during the week of Feb. 23. Distribution of the special edition may take several days, so not all Sandians will receive their copies at the same time. The publication highlights notable FY08 accomplishments and milestones from across the Labs.

The next regular issue of the *Lab News* will be dated March 13.

Sandia study finds that biofuels can provide viable, sustainable solution to reducing petroleum dependence

By Mike Janes

At a press conference in New York City on Feb. 10, General Motors and Sandia announced that biofuels made from plants, forestry waste, and dedicated energy crops could sustainably replace nearly a third of US gasoline usage by 2030. The announcement was made at the Biotechnology Industry Organization (BIO) CEO & Investor Conference.

Bob Carling, director of Transportation Energy Center 8300, presented the results of the GM-funded "90 Billion Gallon Biofuel Deployment Study." The goal was to assess if and how a large volume of cellulosic biofuel could be sustainably produced, processed, and delivered assuming technical and scientific progress continues at expected rates. The study was conducted at Sandia and GM over a period of nine months.

"This wasn't just GM coming to us to ask us to do a study for them," said Bob at the news conference, "but instead it was a teaming opportunity where we were able to collectively address a critical national need alongside our GM partners."



SANDIA TRANSPORTATION ENERGY Center 8300 Director Bob Carling speaks at a joint Sandia/GM news conference in New York on Tuesday about the results of a major biofuels study. Looking on is Brent Erickson of BIO (Biotechnology Industry Organization), which represents more than 1,100 biotechnology companies, academic institutions, state biotechnology centers, and related organizations across the US and in 31 other nations. (Photo by Mike Janes)

Sandia and GM researchers examined the interdependencies of land, water, infrastructure, workforce, economic, technology, and environmental factors and assessed the feasibility, implications, limitations, and enablers of annually producing 90 billion gallons of ethanol — sufficient to replace more than 60 billion of the estimated 180 billion gallons of gasoline expected to be used annually by 2030. Ninety billion gallons a year exceeds DOE's goal for ethanol production

established in 2006.

"In this study, Sandia leveraged its systems analysis expertise to develop a framework for open and transparent decision making," says Terry Michalske, director of Energy Innovation Initiatives Center 6100. "This approach will prove invaluable in supporting investment and policy decision making and in helping to monitor and assess progress going forward."

The 90 Billion Gallon Study assumes that 75 billion gallons would be ethanol made from nonfood cellulosic feedstocks and 15 billion gallons from corn-based sources. The study examined four sources of biofuels: agricultural residue, such as corn stover and wheat straw; forest residue; dedicated energy crops, including switchgrass; and short-rotation woody crops, such as willow and poplar trees. It examines the costs of producing, harvesting, storing, and transporting these sources to newly built biorefineries.

Using a newly developed tool known as the Biofuels Deployment Model, or BDM, Sandia researchers determined that 21 billion gallons of cellulosic ethanol could be produced each year by 2022 without displacing current crops. The Renewable Fuels Standard, part of the 2007 Energy Independence and Security Act, calls for ramping up biofuels production to 36 billion gallons a year by 2022.

The 90 Billion Gallon Study, which focused only on starch-based and cellulosic ethanol, found that an increase to 90 billion gallons of ethanol could be sustainably achieved by 2030 within real-world economic and environmental parameters.

Other findings:

- The domestic investment for biofuels production is projected to be virtually the same as the investment required to sustain long-term domestic petroleum production.
- Policy incentives such as a federal cap and trade program, carbon taxes, excise tax credits, or loan guarantees for cellulosic biofuels are important to mitigate the risk of oil market volatility.
- Cellulosic biofuels could compete without incentives with oil priced at \$90 per barrel, assuming a reduction in total costs as advanced biofuels technologies mature.
- Continued support of R&D and initial commercialization is critical because sustained technological progress and commercial validation is a prerequisite to affordably producing the large volumes of ethanol considered in this study.
- Large-scale cellulosic biofuel production could be achieved at or below current water consumption levels of petroleum fuels from on-shore oil production and refining.

The industrial processes by which nonfood forms of biomass are converted into sugars suitable for produc-



GOOD NEWS — Sandia Center 8300 Director Bob Carling, left, GM VP for Research and Development and Strategic Planning Larry Burns, and Matthew Carr, a policy analyst with the BIO organization, at the Sandia/GM biofuels news conference in New York. (Photo by Mike Janes)

tion of biofuels were a focus of the study.

Sandia's analysis also included land use, water availability, energy used to produce cellulosic biomass, transportation of feedstocks, and other potential leverage points for the development and use of cellulosic biofuels. In conducting its research, Sandia utilized models that examined current and future technologies for development of ethanol.

Future enhancements to Sandia's BDM are planned, contingent on additional partnerships. Such improvements to the current software tool, says Carrie Burchard, from Business Development Support Dept. 8529, would provide an even more comprehensive systems understanding of the biofuels industry.

Sandia enjoys a longstanding relationship with all the major US automakers and engine manufacturers, and has worked previously with GM on a variety of automotive research activities. Sandia also plays a major role in the Joint BioEnergy Institute (JBEI) and several other transportation energy and biofuels projects.

An executive summary of the 90 Billion Gallon Biofuel Deployment Study can be found at www.hitctransportation.org.

Larry Burns, GM's VP for Research & Development and Strategic Planning, in remarks at the news conference put the Sandia/GM work in real-world perspective: "If you really want to impact imported oil and move the needle quickly, there's nothing more attractive than biofuels in the automotive sector."

Sandia California News

James Sweeney presents California Policy Seminar



STANFORD UNIVERSITY Professor James Sweeney, left, talks with, from left, Terry Michalske, director of Energy Innovation Initiatives Center 6100; Karen Scott (12122), Calif. Government Relations manager; Ron Stoltz (8302), manager of the National Energy Initiatives project; and Transportation Energy Center 8300 Director Bob Carling after giving a California Policy Seminar on Jan. 20. Sweeney is a key player in the National Academy of Sciences "America's Energy Future" initiative. His many leadership roles include director of the Precourt Institute for Energy Efficiency; Senior Fellow of the Stanford Institute for Economic Policy Research; Senior Fellow of the Hoover Institution on War, Revolution and Peace; and Senior Fellow of the Stanford Institute for International Studies.

Dick Steeper wins Forest McFarland Award from Society for Automotive Engineers

By Patti Koning

Dick Steeper (8362) has been honored by the Society for Automotive Engineers (SAE) with a 2009 Forest McFarland Award. Only about 20 Forest McFarland Awards are given each year; Dick is the fifth Sandian to receive one.

The Forest McFarland Award recognizes individuals for: 1) their outstanding contributions toward the work of the SAE Engineering Meetings Board (EMB) in the planning, development, and dissemination of technical information through technical meetings, conferences, and professional development programs; or, 2) outstanding contributions to the EMB operations in facilitating or enhancing the interchanges of technical information.

"Sandia's engagement in technical societies is an important aspect of our service to the nation. It's great to see that Dick's hard work for the SAE over several years is being recognized," says Dennis Siebers (8362), Dick's manager.

Dick and Paul Miles (8362), a 2002 McFarland Award recipient, are currently the co-vice chairs of the SAE Powertrain, Fuels, and Lubes (PF&L) activity — a large division of SAE's Land and Sea Group. This activity plays a central role in organizing the technical program of three major international meetings each year

(the World Congress, the fall PF&L meeting, and the spring international meeting), as well as other SAE events.

The role of the vice chair, Dick says, is to assist the chair in organizing SAE meetings. "Our goal is to make the meetings as meaningful as possible," he says. "SAE meetings are extremely valuable as a place to disseminate timely results to the transportation research community," adding that SAE is the prime location for publishing such research. The faster turnaround than other journals — six months compared with a year or more — aids in the dissemination of new work.

Dick is also a member of SAE's Technical Quality Response Team, which implements quality standards for SAE publications. A current focus is getting SAE journal papers included in the Science Citation Index.

Dick and Paul will become co-chairs of the SAE Powertrain, Fuels, and Lubes activity at the end of their three-year term as vice chairs.



DICK STEEPER

Sandia's diamond-like films on board NASA satellite

IBEX looks at materials coming into solar system



INTERSTELLAR FILMS — Tom Friedmann (1112) checks out a sample diamond-like carbon film he created for the low-energy sensor (IBEX-Lo) on board NASA's Interstellar Boundary Explorer (IBEX). Thirty films are on board the IBEX. (Photo by Randy Montoya)

By Michael Padilla

Diamond-like carbon films created at Sandia are helping probe the far boundaries of the solar system as part of a NASA mission to study how the sun's solar wind interacts with the interstellar medium — the matter that exists between the stars within a galaxy.

The films are in the low-energy sensor (IBEX-Lo) on board NASA's Interstellar Boundary Explorer (IBEX), which lifted off in October on a mission to study the farthest fringes of the solar system. IBEX's two bucket-sized sensors, covering high and low energy ranges, are designed to capture particles bouncing back toward Earth from the distant boundary between the hot wind from the sun and the cold wall of interstellar space.

The active conversion surface of the low-energy neutral atom detector is coated with Sandia's diamond-like films created by Tom Friedmann (1112).

"The primary purpose of the diamond-like carbon films is to provide a surface that will efficiently ionize energetic neutral atoms," Tom says, "so they can then be detected. Smooth surfaces are required so that the scattered particles can be efficiently collected. If the surface is rough, scattered particles are lost, decreasing efficiency. The diamond-like carbon films have an average surface roughness that is about one angstrom. This is

less than the diameter of a carbon atom."

To create the 30 films aboard the system, Tom used pulsed-laser deposition to deposit the films on the conversion surfaces. Carbon was used because it has relatively high conversion efficiency, low sputter yield, and is very smooth, he says. Single crystal diamond has the highest efficiency but is too expensive to grow over large areas and difficult to polish to the extremely low surface roughness needed. The diamond-like carbon films naturally grow smooth and require no polishing.

Tom says the project took about one and a half months to complete and he says he was pleased with the outcome. Now the IBEX team is awaiting the results from the mission.

The IBEX team received a shock when the satellite was initially activated. A high-voltage system failed in the low-energy sensor, and it was initially feared that the mission would be diminished by the loss of that sensor's data. But the team found a workaround that enables successful IBEX-Lo operation after all and that will allow the mission to achieve most of its goals.

Eric Hertzberg, from Lockheed Martin Advanced Technology Center, approached Tom to create the films. Hertzberg is the lead engineer for the IBEX-Lo Sensor. Bob Nemanich, Arizona State University, also played a key role in passivating the films. Tom says Sandia uses

Carbon state

(Continued from page 1)

the generation of magnetic fields," says Mike. "So, accurate knowledge of phases of carbon in planetary interiors makes a difference in computer models of the planet's characteristics. Thus, better equations of state can help explain planetary magnetic fields that seem otherwise to have no reason to exist."

At NIF in 2010, 192 laser beams are expected to focus on isotopes of hydrogen contained in a little spherical shell made of diamond. The idea is to bring enough heat and pressure to bear to evenly squeeze the shell, which serves as a containment capsule. The contraction is expected to fuse the nuclei of deuterium and tritium within.

The success of this reaction would give more information about the effects of a hydrogen bomb explosion, making it less likely the US would need to resume nuclear weapons tests. It could also be a step in learning how to produce a contained fusion reaction that could produce electrical energy for humanity from seawater, the most abundant material on Earth.

For the reaction to work, the spherical capsule must compress evenly. But at the enormous pressures needed, will the diamond turn to slush, liquid, or even

to the solid bc8? A mixture of solid and liquid would create uneven pressures on the isotopes, thwarting the fusion reaction, which to be effective must offer deuterium and tritium nuclei no room to escape.

That problem can be avoided if researchers know at what pressure point diamond turns completely liquid. One laser blast could bring the diamond to the edge of its ability to remain solid, and a second could pressure the diamond wall enough that it would immediately become all liquid, avoiding the slushy solid-liquid state. Or a more powerful laser blast could cause the solid diamond to jump past the messy triple point, and past the liquid and solid bc8 mixture, to enter a totally liquid state. This would keep coherent the pressure on the nuclei being forced to fuse within.

The mixed-phase regions, says Dan, are good ones to avoid for fusion researchers. The Sandia work provides essentially a roadmap showing where those ruts in the fusion road lie.

Sandia researchers achieved these results by dovetailing theoretical simulations with laboratory work.

Simulation work led by Mike used density functional theory to establish the range of velocities at which projectiles, called flyer plates, should be sent to create the pressures needed to explore these high pressure phases of carbon and how the triple point would reveal itself in the shock velocities.

(Density functional theory is a powerful method for solving Schrödinger's equation for hundreds to thou-

Family Day

(Continued from page 1)

In keeping with the Labs' focus on austerity (*Lab News*, Jan. 30, page 1), this event will incorporate the annual Take Your Daughters and Sons to Work Day, which typically occurs in April.

"A key goal for these two events when they occur separately is educational outreach," says Bruce McClure, manager of Community Involvement Dept. 3652. "By taking the opportunity to incorporate Take Your Daughters and Sons To Work Day with a Family Day open house, we're enhancing the opportunity to inform our young folks about the wonderful and exciting things Sandia is doing in our nation's interest."

"The Family Day planning team is already hard at work to ensure that this event meets expectations of the Sandia family," says David Keese (12150), coordinator of the Labs' 60th anniversary observance, which includes Family Day. Throughout much of 2009, the anniversary will be marked by a variety of events. "Many at Sandia were collectively disappointed when previous open houses at the New Mexico site were cancelled in 2004 and 2005. The team is taking extra steps to ensure that this Family Day occurs as planned and we are able to collectively celebrate our past and look forward to the future," David says.

The open house likely will be the most visible of several local Labs-wide 60th anniversary events.

Some of those other events, which are targeted to both internal and external audiences of a various sorts: a Greater Albuquerque Chamber of Commerce luncheon with Labs Director Tom Hunter, a 60th anniversary Sunday supplement in an upcoming issue of the *Albuquerque Journal*, completion of a new traveling exhibit depicting major accomplishments throughout the Labs' history, involvement in the grand opening of the new National Museum of Nuclear Science and History, formerly the National Atomic Museum, and some activities in Washington, D.C., designed to better inform new and important members of Congress about the Labs' vision for the future.

Websites for the open house and other 60th anniversary activities will be appearing in the coming weeks and months throughout 2009.

Individuals — including Labs' student interns — interested in volunteering their time to work at the Family Day open house should contact Patty Zamora, Sandia Serves Volunteer coordinator (844-2146, pgzamora@sandia.gov).

Questions about Family Day 2009 should be directed to Rod Geer, wrgear@sandia.gov.

similar films in studies of electron field emission and in microelectromechanical systems (MEMS) devices.

Voyager 1, launched in 1977, made the first direct measurements of this boundary (the heliopause) as it was the first spacecraft to leave the inner solar system and head toward interstellar space. Voyager 2, launched the same year, will also relay observations of the boundary — but these measurements are of only one place and time. IBEX is designed to provide a three-dimensional map of the boundary.

sands of atoms using today's large computers.)

Using these results as guides, experimental results from 15 flyer-plate flights — themselves powered by the extreme magnetic fields of Sandia's Z machine — in work led by Marcus, then determined more exact change-of-state transition pressures than ever before determined. Even better, these pressures fell within the bounds set by theory, thus showing that the theory was accurate.

"These experiments are much more accurate than ones previously performed with laser beams," says Marcus. "Our flyer plates, with precisely measured velocities, strike several large diamond samples, which enables very accurate shock wave velocity measurements."

Laser beam results, he says, are less accurate because they shock only very small quantities of material, and must rely on an extra step to infer the shock pressure and density.

Sandia's magnetically driven plates measure about 4 cm by 1.7 cm in cross section, are hundreds of microns thick, and impact three samples on each firing. Z's target diamonds are each about 1.9 carats, while laser experiments use about 1/100 of a carat.

"No, they're not gemstones," says Mike about the Sandia targets.

The diamonds in fact are created through industrial processes and have no commercial value, says Dan, though their scientific value has been large.

Pssst . . . wanna buy some acetonitrile?

Shortage of solvent used in chemical separations has scientists scrambling for sources

By Michael Brumbach (1816)

Would you ever expect that the decline in automobile sales and electronic goods is affecting the ability of scientists to do chemical separations at Sandia and across the globe? Scientists and technicians, in pharmaceutical labs and laboratories in general, are facing a critical shortage of acetonitrile, a common chemical solvent with numerous applications. The decline in acetonitrile production is linked to the slowing of manufactured goods worldwide.



ACETONITRILE is in short supply.

Acetonitrile is a liquid with the chemical formula CH_3CN . It is the solvent of choice for chromatography, a standard technique for separating, analyzing, and/or purifying chemicals. Acetonitrile's preferred use in chromatography comes from its exceptional properties at dissolving other substances, its low viscosity, and its lack of acidity. Acetonitrile is also a ubiquitous electrolyte for electrochemical applications such as in batteries. However, despite its common usage, there is no designated chemical production of acetonitrile. It is a byproduct in the production of acrylonitrile, one of the building blocks of plastics for use in automobiles and electronic housings. The sharp decline in sales of many of these products has led to decreased manufacturing, which has led to a decrease in acrylonitrile production and, as a result, less acetonitrile.

Chemists are searching for every last bottle of the now-precious liquid.

"A liter that once sold for tens of dollars can now go for as much as \$140," says contractor Steve Chrisman (2555).

However, you can only buy it if you can find someone selling it. Common chemical suppliers such as Sigma-Aldrich and JIT supplier to Sandia, Fisher, have issued memos to customers suggesting it may be late 2009 before they can begin supplying acetonitrile without months of delays. Only regular customers with a significant ordering history are being given preference in the long lists of customers waiting for back-ordered product.

"The specific grade of acetonitrile and the manufacturer, specified or otherwise," Steve says, "can also play a role in which customers get their order filled first."

This is especially problematic for start-up companies and companies whose procedures are operating under federal regulatory controls specific to acetonitrile. It is often too costly and time-consuming for these companies to switch to other solvents.

As with any process where a commodity becomes precious, scientists scramble to find ways to reduce, recycle, and, when possible, search for alternatives. And there are alternatives to acetonitrile, including methanol, water, and mixtures thereof, but these have unacceptable properties for many applications. Sandia's Chemical Exchange Program and a culture of networking have helped some Sandians cope with the recent shortage.



STEVE CHRISMAN displays a rack of chemicals prepared for separation in the high-performance liquid chromatography device (in the background). Steve routinely uses acetonitrile in the laboratory as a key tool in the chemical separation process. The global shortage of acetonitrile has researchers scrambling for alternatives. (Photo by Randy Montoya)

James Barnett (6418), who several weeks ago put out a request for acetonitrile via the Chemical Exchange Program, says, "I've found that Sandians are very generous; I've been getting acetonitrile donations from a variety of sources." James has also modified some of his processes to use less of the currently scarce solvent.

Despite the expectation that production will increase in the near future, it is also expected that prices may remain high as demand persists.

Job restructure

(Continued from page 1)

extend the project's timeline, says John. These considerations, ultimately, tie to the need to avoid unnecessary costs and, where possible, simplify interdependent projects.

The planned PeopleSoft 9.0 upgrade, a significant IT modernization project scheduled for completion in spring 2010, is one major factor, he says. In discussions with Sandia's IT people it became apparent that signifi-

cant time and cost savings would result if Sandia incorporates the new job structure into the system just once as it comes on line. (PeopleSoft is the software Sandia uses for the vast majority of its HR functions.)

"Basically, doing this once rather than twice will save an enormous amount of time and money," says John.

Another factor, just as critical, says John, is lingering questions about the design of the new job structure itself. The team continues to weigh competing expectations for the new structure, such as making sure it is standardized enough for meaningful market salary comparisons and flexible enough to allow a person to

switch to an occupation with a different salary band.

"We have asked for and received lots of feedback, your feedback, and we agree that this is a complex change that requires deep thought on everyone's part," he says. "These are important decisions. We want to get this right, and we will."

The extra time will allow the team to continue to engage thoughtfully with senior management, managers, and employees on these key issues.

Difficult work continues

Meanwhile, managers across the Labs continue to match individual employees to occupations as part of a preliminary mapping process to be completed at the end of February. This exercise will allow a consulting firm hired by Sandia to perform a market analysis this spring that will be the foundation of the new job structure, including its market-based salary bands.

The current round of mapping is preliminary because its purpose is not to place people in their final occupations but rather to allow the team to troubleshoot the new structure and the consultant to begin working on the market salary bands.

"With preliminary mapping we will be able to fine-tune the descriptions, which will allow us to identify and investigate possible problems with the descriptions," says Job Restructure Project Lead Melissa Creange (3002). "This will help make the final implementation more seamless."

Melissa notes that the compensation review cycle that begins this fall will be based on the current Integrated Job Structure.

Why a new job structure?

Sandia is replacing its 11-year-old Integrated Job Structure with a new structure. The IJS, says HR & Communications Div. 3000 VP John Slipke, has grown out of sync with modern business practices and the labor market and is in need of revision (*Lab News*, May 23, 2008).

The job structure is important because it provides the basis for employees' job levels, performance expectations, and compensation levels.

The new structure being designed by a team of representatives from each of Sandia's divisions will depart from the IJS's two large job ladders — one for technical staff and one for administrative staff — in favor of many occupations organized within several job families. This will allow individual occupations

to have a much closer alignment with the external job market.

This alignment, in turn, will help Sandia offer current and future employees pay and career opportunities that more closely match what their peers are receiving outside the Labs, John says.

Over the long term, more closely matching pay to the jobs people do will help Sandia attract and retain the best people to support Sandia's mission.

"As we compete for skilled people and for mission work, an updated, flexible, and more market-based job structure is a necessity," says John. "It is one important way for the Labs to remain both technically capable and attractive to customers, which is good for all of us at Sandia."

Mileposts

New Mexico photos by Michelle Fleming
California photo by Randy Wong



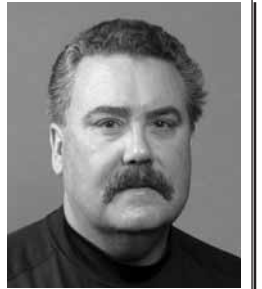
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Richard Kinchen
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Mark Bishop
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Vernon Koonce
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Johnson Morgan
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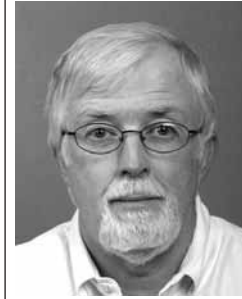
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James Knapp
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Kirk Rackow
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Jay Grimley
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Vicky Blackberg
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Manuel Trujillo
30 2453



Milton Vernon
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H. John Bell
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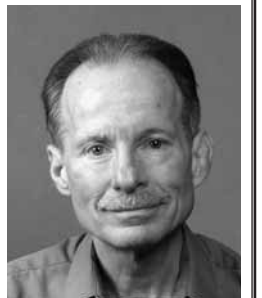
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Warren Klein
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Nanette Morton
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Don Wesenberg
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David Kozlowski
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Dean Rovang
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John Schwartz
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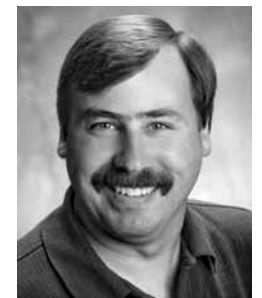
Paul Yourick
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Jeffery Adams
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Valene Begano
20 10662



James Berg
20 8238



Peggy Desko
20 6900



Sally Ek
20 10667



Mary Girven
20 9512



Jerome Jakubczak
20 5710



Richard Nygren
20 1658



Debra Lujan
20 5761



Robert Martinez
20 9536



Cindy Serna
20 5000



Barbara Wampler
20 5733



James Wiseman
20 6452



Jenny Dubbs
15 10648



Angela Guerin
15 6711



Michael Lopez
15 2717



Mark Spoonamore
15 9547



Rusty Wright
15 6000

Recent Retirees

SERP services

Through the Sandia Employee Recreation Program (SERP) you can get discounts on movie tickets and gym memberships, tickets to sports and entertainment events, as well as free DVD rentals and low-cost camping and sports equipment rental. SERP also is the source for Sandia logo merchandise that includes T-shirts, hats, mugs, and pens. For those who are active sports participants, SERP provides access to a wide variety of sports and recreational associations for you and your family.

Discounts

- Discounted bus passes: \$20 monthly city bus passes; cash only
- Discounted tram tickets: \$9 each; 4 tickets available per day
- Discounted movie tickets: Regal Entertainment (United Artists) tickets; \$6.50 each
- Gym memberships: Discounted memberships available for Defined Fitness

Services

- Equipment rentals: Camping and backpacking equipment, canoes, snowboards, snowshoes, etc., are available for rental
- Movie rentals: We now have 450 DVDs for free rental - No more VHS videos
- Chair massages: 20 minutes for \$20
- Sandia logo merchandise: Purchase hats, pens, lapel pins, T-shirts, polo shirts, etc.

Associations

- Basketball
- Bowling
- Bridge
- Flag Football
- Golf - Sandia Golf Association
- Golf - Women's
- Running
- Ski
- Soccer
- Softball
- Volleyball

Tameka Barrentine honored as Modern-Day Technology Leader

By Chris Burroughs

Tameka Barrentine, computer scientist in Software Engineering and Qualification Environments Dept. 6325, will be named "Modern-Day Technology Leader" during the 23rd annual National Black Engineer of the Year Award (BEYA) Global Competitiveness Conference Feb. 20 in Baltimore, Md.

Modern-Day Technology Leaders are men and women of color who are demonstrating outstanding performance and will shape the future course of engineering science and technology. They are innovators who demonstrate excellence in science, engineering, or technology; leadership in their workplaces and communities; outstanding work as role models and mentors; and commitment to recruiting and retaining minorities in the nation's science and technology enterprises.

The annual conference, held during Black History



TAMEKA BARRENTINE

Month, is sponsored by Lockheed Martin, Council of Engineering Deans of the Historically Black Colleges and Universities, and *US Black Engineer & Information Technology* magazine. Tameka, who was nominated for the honor by her manager Ellen Lemen, will be presented a certificate of recognition during the Modern-Day Technology Leadership Luncheon.

Tameka has a BS in computer science from Bennett College in Greensboro, N.C., and an MS in human computer interaction from Carnegie Mellon in Pittsburgh, Pa. An eight-year employee of Sandia, Tameka's job is to help redesign software and other technologies to be more user friendly. She has been instrumental, Ellen says, in conducting computer usability research on vital Sandia management assurance websites, conducting testing and redesigning the sites for better operability.

Tameka is a regional officer of the National Society of Black Engineers (NSBE) and the advisor of the Albuquerque middle and high school NSBE chapter. She serves as a mentor to young people, encouraging them to go to college and study math and science. She also recruits for Sandia at Carnegie Mellon, serves as co-coordinator of the Hands-On Minds-On Technology program at Sandia, and is a member of the Sandia Black Leadership Committee.

Adrian Casias loves working at Sandia about as much as driving a tractor



STRIPPING LINE — Adrian takes a moment during one of his recent fly fishing trips — one of his many outdoor hobbies. (Photo courtesy of Adrian Casias)

By Iris Aboytes

When Adrian Casias (2452) attended Del Norte High School in northeast Albuquerque, his friends were not interested in school. Adrian was different. He loved math and science.

Adrian is a microelectronics packaging engineer in Sandia's Advanced Prototyping S&T organization. He is currently working to develop and manufacture a biomedical-friendly, high-density, hermetic, platinum feed-through array in ceramic prototype for an industrial partner in an active cooperative research and development agreement (CRADA).

Adrian was part of Sandia's 2007 Weapon Intern Program class. "The program provided me a unique opportunity to leverage insight, knowledge, and experience from many of Sandia's most knowledgeable nuclear scientists, engineers, and mentors in all aspects of nuclear weapons policy, design, and operations," says Adrian. "The program is focused on transferring decades of weapons knowledge to the nuclear weapon stewards of tomorrow. I really enjoyed the program and considered it a privilege to participate.

"Looking back, it was in seventh and eighth grades when Miss Comber and Miss Thomas made math very interesting and appealing that I got hooked," says Adrian. "Or maybe it was my fascination with multiplication tables that ignited my love for math."

During the summers in high school he took advan-

tage of various engineering summer internships offered through the American Indian Science and Engineering Society (AISES). After high school he attended Oklahoma State University (OSU) on a scholarship. "I chose OSU largely due to the smaller classes and growth in the engineering college," says Adrian. "You have a disconnect if you are not passionate about what you want to do. Passion can take you into further learning."

He was hired at Sandia when he received his BS in chemical engineering, and Sandia's OYOC (One Year on Campus Program, now called the Master's Fellowship Program) enabled him to receive his MS in chemical engineering from Stanford.

Adrian says he learned about hard work and ethics working on his grandparents' farm in Antonito, Colo., and from his Navajo

mother Louise and Hispanic father Ernest. His father's roots are embedded in New Mexico's rich Spanish culture.

His grandparents, Jasper and Ceobita Casias, have lived their lives as ranchers raising primarily cattle. "They raised pigs, chickens, horses and the occasional ducks, turkey, and guinea — for grandma's happiness and the grandchildren's amusement," says Adrian. "I harrowed, raked, baled, and bucked bales with the tractor in the fields. I helped drive cattle, vaccinate, brand, and do just about anything with the cattle. I loved spending any free time from school on the farm.

"I am the oldest grandchild.

I loved that my grandpa placed a large amount of trust and responsibility in me. He was confident I could get things done. We were a team! I absolutely loved driving the tractor and working the equipment," adds Adrian. "I was fascinated with mechanical equipment and understanding how it worked, and most importantly how not to break it. If I did, I would have to fix it. If not for the farm, where else would a kid in elementary and middle school get the opportunity to drive and work with farm equipment?"

Adrian enjoys all sports. "I am a slave to my hobbies," he says. "I particularly enjoy fly fishing. My grandpa taught me bait fishing. It was one of the few times we were able to do something 'play-like.' His inner child would come out. I remember being with him late in the evenings, getting ready to leave right when the fishing

President Barack Obama on African American History Month

Following are brief excerpts from President Barack Obama's official proclamation declaring February as African American History Month 2009:

The history of African Americans is unique and rich, and one that has helped to define what it means to be an American. Arriving on ships on the shores of North America more than 300 years ago, recognized more as possessions than people, African Americans have come to know the freedoms fought for in establishing the United States and gained through the use of our founding principles of freedom of speech, freedom of the press, the right to assembly, and due process of law. The ideals of the Founders became more real and more true for every citizen as African Americans pressed us to realize our full potential as a Nation and to uphold those ideals for all who enter into our borders and embrace the notion that we are all endowed with certain unalienable rights. . .

As we mark National African American History Month, we should take note of this special moment in our Nation's history and the actors who worked so diligently to deliver us to this place. One such organization is the National Association for the Advancement of Colored People — the NAACP — which this year will witness 100 years of service to the Nation on February 12. Because of their work, including the contributions of those luminaries on the front lines and great advocates behind the scenes, we as a Nation were able to take the dramatic steps we have in recent history.

President Obama's entire proclamation can be found at <http://tinyurl.com/cpunbv>.

got great. We'd always push our luck with the setting night and leave late. He would say, 'We better get home quick or your grandma's gonna be mad.' It's hilarious — my grandma's never mad."

Adrian's list of hobbies also includes soccer, mountain biking, snowboarding, and tennis.

"I feel very lucky to be at Sandia," says Adrian. "I love how Sandia embraces individuality. I have been given the opportunity to select a research area and pursue it.

"I believe in Sandia's mission and enjoy the work environment. I love the challenges, the state-of-the-art equipment, and availability of world experts in almost any field imaginable. I enjoy the in-depth diversity of project research areas. I am proud to say I work at Sandia. Participating in Sandia's intern program was a once-in-a-lifetime opportunity. I hope I can honor those before me by using that knowledge for Sandia's mission."

History of Labs is subject of Sunday talk



REBECCA ULLRICH

Sandia Corporate Historian Rebecca Ullrich and Corporate Archivist Myra O'Conna will give a presentation on the history of the Labs Sunday at 1:30 p.m. as part of the Albuquerque Historical Society's Journey Across Albuquerque series. Their talk, "A History of Sandia," will be at the New

Mexico Veterans Memorial Visitor Center, 1100 Louisiana Blvd. SE.

Program focuses on early history

The presentation will focus heavily on the early history of the Labs — from its roots as Z Division, created in 1945 as the ordnance design, testing, and assembly arm of Los Alamos, on through its growth into a well-defined, mature institution by 1960, to its place as a multiprogrammatic laboratory.

Particular attention will be placed to the motivating factors in Sandia's early growth and development as part of the US nuclear weapons complex. For more information about the presentation call 299-5019.