S andia researchers have confirmed the particle-by-particle mechanism by which lithium ions move in and out of electrodes made of lithium iron phosphate (LiFePO₄, or LFP), findings that could lead to better performance of lithium-ion batteries in electric vehicles, medical equipment, and aircraft.

The research is reported in an article titled “Intercalation Pathway in Many-Particle LiFePO₄ Electrode Revealed by Nanoscale State-of-Charge Mapping” in the journal Nano Letters, 2013, 13 (3), pp 866-872.

Authors include Sandia physicist Farid El Gabaly (8656) and William Church of Stanford University. LFP, a natural mineral of the olivine family, is one of the newer materials being used in lithium-ion batteries and is known to be safer and longer lasting than the lithium cobalt oxide (LiCoO₂) compound used in smart phones, laptops, and other consumer electronics. While LFP material is intriguing to researchers and battery manufacturers for those reasons, the process by which lithium ions move in and out of LFP as the battery stores and releases its energy is not well understood. This has proven to be a barrier to the material’s widespread adoption.

Cathode materials like LFP are critical in the search for higher-capacity, long-life, lithium-ion batteries for applications where batteries can’t be replaced as easily or as often as they are in consumer electronics. Larger applications where lithium cobalt oxide cells eventually could be replaced by LFP batteries include electric vehicles and aircraft.

‘Popcorn’-like particle pathways promise better performance in lithium-ion batteries

By observing complete battery cross-sections, the researchers have provided key insights on a controversy over the process that limits the battery charging and discharging rates. Previous attempts to optimize the charging/discharging speed have included coating the particles to increase their electrical conductivity and reducing particle size to speed up their transformation, but have overlooked the initiation process that may well be the critical rate-limiting step in the way that lithium moves from a particle’s exterior to its interior.

By using X-ray microscopy to examine ultrathin slices of a commercial-grade battery, Sandia researchers found evidence that charging/discharging in LFP is limited by the initiation of phase transformation, or

(Continued on page 5)
That's that

Every year since Lockheed Martin assumed management of Sandia back in 1993, it has sponsored one of the most inspiring annual recognition programs in the community. I’ve been involved in the ‘Thunderbird Award’ for many years in which a group of students from area high schools are honored with award money for overcoming adversity or surmounting obstacles in their lives and finding success in their studies. It’s a little ironic, the word ‘adversity’ connotes, aren’t really very descriptive. “Oh, you overcame ‘adversity,’” Good for you.” But when you get down to the details, if you bore down into the words you might find in individual cases, as Nancy Salem does with a story on page 12 of this issue, you come away in awe – I don’t think that’s too strong a word – for these kids.

It’s a bit odd to have a role model who is 20, 30, 40 years younger than you, but if you’re looking for someone to emulate, start here. . . .

Now every and then a YouTube video so captures the spirit of the times that it goes viral. Usually, the videos that grab the public imagination are fun stuff, fluffy stuff, curious stuff, even astonishing stuff, but by large they’re ultimately trivial. Cute kittens. An unlikely South Korean dance sensation. Someone, anyone doing something stupid. Or dangerous. Or, usually, dangerously stupid. But a couple of weeks back a new video went viral and in the process a new YouTube superstar was born.

On the printed page, the words “overcoming adversity” come easy, aren’t really very descriptive. “Oh, you overcame ‘adversity,’” Good for you.” But when you get down to the details, if you bore down into the words you might find in individual cases, as Nancy Salem does with a story on page 12 of this issue, you come away in awe – I don’t think that’s too strong a word – for these kids.

Regarding Hadfield, he’s a Canadian farm boy become fighter pilot become astronaut who is both totally ‘cool’ as one of those individuals who’s just good at everything he does. He clearly sees that there’s a public component to being an astronaut and he has embraced that part of his role with enthusiasm, humor, and humility, and he is really, really good at it. Want some proof? Check out the social media stuff he’s done from his own flight. Hadfield recorded the video on his iPad – yes, that is him singing Space Oddity. It was his closing communiqué from space, and an unforgettable farewell to the station it was.

I heard the “first-ever!” music video recorded in space was available for viewing. I have to admit, I cringed. Amateur hour, right? But being a space buff, if not a music video buff, I opened the YouTube link and was immediately captivated. I won’t try to describe it. Just look it up and watch it. I think you’ll agree with Dave Bowie’s own tweet about the video: “Possibly the most poignant version of the song ever created.”

The Space Oddity video wasn’t a spontaneous, spur of the moment creation; in fact, it was carefully planned out. The process beginning months before the mission. Hadfield even got get permission from Bowie to ably alter the words to make it relevant to his own flight. Hadfield recorded the video on his iPad – yea, that is his singing and playing the guitar in real-time – and it was subsequently edited planetside by Hadfield’s son and another colleague.

The Canadian media is crediting Hadfield with singlehandedly “making space cool again.” I can believe it. ‘He’s a cool guy and a real hero in Canada. If he were so inclined, I think he’d have a very successful career in politics. Whatever he chooses to do, he’s going to be very successful. I hope he stays close to the space program. We need all the heroes and champions we can get and Hadfield is a particularly compelling one.

See you next time.

— Bill Murphy (505-845-0845, Ms 1448, wtmurph@sandia.gov)

Local ACS chapter gets climate change grant

With interest in climate change heating up, a New Mexico section of the American Chemical Society has received a $3,000 ACS Presidential Climate Science Challenge Grant to help educate the general public to the science issues involved, says group leader and Sandia researcher Bernadette Hernandez-Sanchez (1915).

One difficulty to overcome for the Central New Mexico Climate Science Program is that “although we have one of the largest PhD per capita ratios, a large discrepancy still remains in education level between many of our state’s citizens and our technical community,” says Bernadette.

The difference is compounded by the large distances between New Mexico technical centers and the general population, and by economic and cultural differences.

To overcome these difficulties, the group has partnered with the University of New Mexico, Sandia National Laboratories, New Mexico Tech, and New Mexico Highlands University to conduct communication workshops to each volunteer to climate science and about speaking to the public.

Also potentially useful will be the development of hands-on kits that illustrate basic chemistry concepts. The program plans a monthly or quarterly public seminar series called ACS NM Climate Science Saturdays, where experts will present their updates on the subject.

Similar grants were awarded by ACS to other local sections, identified in an ACS press release or “Dallas. Fort Worth, Illinois Heartland, Iowa, Kalamazoo, Mich. New York; Northern V.P., Portland, Ore.; Puerto Rico; Puget Sound, and Wakarusa Valley in Kansas.”

ACS Central New Mexico Section grant authors were Bernadette Hernandez-Sanchez and Jeffery Greathouse (writing section), Michael Heagy from New Mexico Tech, and Donivan Porterfield of Los Alamos National Laboratory.

— Neal Singer

Lab News Reader Service

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

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Web users:

A CONVOY of hydrogen-powered fuel cell vehicles demonstrates the potential viability of the technology.

**Aegis BMD System completes successful intercept flight test**

**SANDIA ASSISTED in the launch of this target missile (photo on left) that helped the Missile Defense Agency’s Aegis Ballistic Missile Defense (Aegis BMD) system accomplish a successful test flight May 15. The target missile, an Aegis Readiness Assessment Vehicle-C, took off from the Pacific Missile Range Facility (PMRF). A major sub-system of the vehicle is the Attitude Control Module, a missile section designed, built, tested, and fielded by Center 5400. Target launch activities were controlled from Kauai Test Facility, a tenant on PMRF. US Navy sailors in the Pacific Ocean aboard the USS Lake Erie detected, tracked, and destroyed the target with a Standard Missile-3 (SM-3) Block 1B missile. It was the third consecutive successful intercept test of the Aegis BMD 4.0 Weapon System and the SM-3 Block 1B guided missile. (Photo, left, by Michael Bujarano)

**STANDARD MISSILE – 3 (SM-3) Block 1B interceptor is launched from the USS Lake Erie during a Missile Defense Agency and US Navy test in the mid-Pacific. The SM-3 Block 1B successfully intercepted a target missile that had been launched from the Pacific Missile Range Facility, Barling Sands, Kauai, Hawaii. Following target launch, the Lake Erie detected and tracked the target. The ship, equipped with the second-generation Aegis BMD weapon system, developed a fire control solution and launched the SM-3 Block 1B. The intercept occurred a few minutes later. The mission was the third consecutive successful intercept test of the SM-3 Block 1B missile. (Caption information for photo at right courtesy of Missile Defense Agency, Photo courtesy of US Navy)**
Following extensive deliberation by the Laboratory Leadership Team (LLT), Sandia has documented its expectations to ensure that quality is fully integrated into all facets of the Labs’ work. These expectations include routinely measuring work results to promote continuous improvement and troubleshooting. They also establish measures to assess how well its quality management process contributes to high-quality work results. The measures will contribute to corporate quality that links together many of the milestones.

“I’m really glad that the LLT is excited about an integrated approach to corporate quality that links together many of the milestones.”

— Deputy chief engineer Gary Sanders

QUALITY in all we do

Safety — helps bolster the overall quality of Sandia’s work, Pat says. And, she says, better teamwork will demonstrate Sandia’s commitment to quality than to show how the strategic milestones inherently help Sandia fulfill its mission. Safeguards is an example that will help achieve this.

“With all the priorities that we have in the Laboratories, there comes a point when you hardly know which way to turn,” Pat told the milestone owners at the start of the meeting. “Everyone wants to do the right thing. But with all the priorities that we have, there comes a point when you hardly know which way to turn.”

Pat describes an “aha moment” when she and members of her team realized there was a need for an updated process to help ensure Sandia has resources to fulfill customer and Sandia expectations. Pat quickly called a meeting with the owners — primarily directors and managers — to discuss the notion proposed by Gary Sanders, deputy chief engineer (2200), and the need for an opportunity to apply quality processes and tools to define ways to measure quality implementation and effectiveness with work already in progress.

The milestone owners gave Pat their immediate support. A small team of directors has formed to identify the relationships across milestones and to determine how the milestones could be used to create a more holistic quality methodology at Sandia.

“With all the priorities that we have in the Laboratories, there comes a point when you hardly know which way to turn,” Pat told the milestone owners at the start of the meeting. “Everyone wants to do the right thing. It’s frustrating when activities feel like they are layered one on top of another when they are common principles and should be integrated. We can have more impact by working together and by creating efficiencies along the way.”

Pat presented this approach to Sandia’s executive leadership on May 1 and received their enthusiastic support.

“I’m really glad that the LLT [Laboratory Leadership Team] is excited about an integrated approach to corporate quality that links together many of the milestones,” says Gary. “As one would expect, many of these corporate milestones are elements of a quality management and continuous improvement system. We can use this big picture to assess the completeness of our overall quality system, identify and fill gaps, improve processes, and identify priorities for FY14 as well.”

For example, Gary leads milestone 1.5.1, “Define and implement an engineering assurance process that supports NSNS’s expectations for an Earned Value Management System approach for stockpile modernization.”

Ensuring the right skills, competencies

Gary said during the milestone integration meeting that completion of his milestone is closely tied to milestone 3.3.4, to develop “a graded approach to project management,” led by Jeffrey Kallio, director of Business Management and Operations Center 10600. Gary said the completion of both of these milestones is also linked to the achievement of other milestones, from 5.2.2, to ensure Sandia’s workforce has the right skills and competencies.

The milestone owners went out on a limb that the completion of both milestones will help bolster the overall quality of Sandia’s work performance at Sandia, as well as the expectation for measures and metrics in order to take credit for that work.

The improvements are detailed in Corporate Governance Procedure 100.5.6 — Achieve Quality and Mission Success, which Pat signed in early May after receiving essential feedback from many staff and managers across the Labs. The procedure includes Sandia’s definition of quality and corporate standard for quality, which were rigorously discussed and endorsed by LLT.

LLT is focused on quality as “Meeting customer and Sandia expectations consistently and predictably through flawless execution of our personal and collective responsibilities.” After spirited debate, LLT purposely included the term “flawless execution” as an aspiration goal.

“I’m really glad that the LLT is excited about an integrated approach to corporate quality that links together many of the milestones.”

— Deputy chief engineer Gary Sanders

The aspiration for “flawless execution” recognizes that humans make errors,” says Jack Loyal, senior manager, Management and Assurance Systems Centre 750. “It’s impossible for people to not make mistakes. However, if these mistakes affect our ability to work effectively, they could prevent us from meeting customer and Sandia expectations. We need to strive to detect and remove inadequacies and imperfect results. They are not part of our work, and to prevent mistakes and errors from propagating. The key is preventing defects in everything we do.”

The procedure is posted online in the Corporate Policy System (CPS), and is accompanied with an updated process, CG100.5.6 — Ensure Quality, that incorporates CG100.5.6 as one of the implementing corporate procedures. The procedure defines quality-related authorities and accountabilities and incorporates the 12-criteria framework of DOE Order 414.1D, Quality Assurance, as Sandia’s corporate quality standard. The procedure features a graded approach to quality to ensure that the level, documentation, and actions used to meet customer and Sandia expectations correspond to the type of work being done — from simple work to work with an extremely high degree of risk involved, the customer’s requirements and expectations, and the relative importance to safety, safeguards, and security.

The new procedure has set in motion a series of baseline activities that must be completed by Sept. 16. Each of Sandia’s management entities (four SMUs, the Executive Support Division, Sandia’s 11 divisions, and Sandia’s eight policy areas) must declare a quality management process that is consistent with the Sandia corporate quality standard or to an appropriate national or international standard for quality. After documenting their quality management processes, the entities will grade themselves on how well they currently are executing these expectations. Finally, each management entity will establish measures to assess how well its quality management process contributes to high-quality work results. The measures will contribute to corporate quality measures and metrics, which will be part of Sandia’s management review process.

Most of the management entities have already posted their quality standards and performance measures on their entity’s assurance websites. For instance, the Nuclear Weapons Strategic Management Unit identifies ISO 9001:2008, Quality Management Systems-Requirements, as its quality standard in addition to adhering to QDR quality standards. Division 10000 also complies with ISO 9001:2008 as well as many entity-specific policies, such as the Controllers Manual, Procurement Quality Assurance Manual, Logistics Quality Management System, Guides for Interacting with External Auditors, and the Quality-Significant Procure- ment Handbook.

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Detecting homemade explosives without also finding toothpaste

By Sue Major Holmes

S andia researchers want air- port, border, and other security areas to be able to detect homemade explosives made of hydrogen peroxide without also singling out people whose toothpaste happens to contain peroxide.

That's part of the challenge in developing a portable sensor to detect a common homemade explosive called a FOx (fuel/oxi- dizer) mix, made by mixing hydrogen peroxide with fuels, says Chris Brotherton (6633). The LDRD proved a sensor could identify relatively high concentrations of hydrogen peroxide and differentiate from that a common interfering sub- stance such as water, Chris says. The next step, he says, will be to work with an industrial partner to design an overall system that is faster and can be mass produced.

His work is built on field-structured chemiresistor technology developed at Sandia more than a decade ago by James Martin (1114) and Doug Bead (1716). Chemiresistors are resistance-based sensors for volatile organic compounds. James and Doug, who have pub- lished several papers on their work, developed a signific- antly improved material that allows sensors' response range and sensitivity to be tailored.

Finding the right polymer

Chris also faced the problem of coming up with a way to detect hydrogen peroxide and water, which can exhibit similar behavior in chemire- sistors. The key was choosing certain molecules in a polymer matrix, suggested by his technical mentor, polymer chemistry expert David Wheeler (1714). When exposed to peroxide, those molecules react in a different way than when exposed to water.

The idea is to engineer the polymer to be as similar to the target material as possible, relying on the undergrad- uate rule that like dissolves like. For example, David says, if the target is a substance that's not very polar, you'd choose a polymer with nonpolar groups. If the target had a lot of polarity, like water, you'd develop polymers that could hydrogen bond with water.

The tiny sensor incorporates the polymer and chains of miniscule conductive metal beads. The poly- mer reacts when it's exposed to the substance being analyzed.

“We observed that there were only two phases, one particle,” Chris says. “Instead of being a reusable sensor, it’s more of a disposable dosimeter.” It’s also a detector that doesn’t react to toothpaste and other common peroxide products, he says.

Slicing-and-dicing

Lithium ions move in and out of battery electrode materials as they are charged and discharged. When a rechargeable lithium-ion battery is charged, an external voltage source extracts lithium ions from the cathode (positive electrode) material, in a process known as “delithiation.” The lithium ions move through the electrolyte and inserted (intercalated) in the anode (negative electrode) material, in a process known as “lithiation.” The same process happens in reverse when discharging the battery.

“Of course we knew there were two phases, where the particle either had lithium or it didn’t,” says Farid. “In many previous studies researchers have focused on understanding the charging process inside one particle.”

Fard and his Sandia colleagues took a slice just a bit thicker than a human hair from a commercial-grade battery, just one layer of LFP particles, and mapped the locations of the lithium in about 450 particles when the battery was at different states of charge.

“Our discovery was made possible by mapping the lithium in a relatively large particle ensemble,” he says. The researchers were able to build a commercial-grade coin-cell battery from raw materials using Sandia’s cell battery prototyping facility in New Mexico, which is the largest DOE facility equipped to manufacture small lithium-ion cells. The battery was then charged, tested for normal behavior, and dismantled at Sandia/California using a new method of slicing layers that preserved the spatial arrangement from the cathode to the anode.

Characterizing the material

The Sandia researchers went to Lawrence Berkeley National Laboratory to characterize the materials with state-of-the-art scanning transmission X-ray microscopy at the Advanced Light Source (ALS), and then returned to Sandia’s California site for study by transmission electron microscopy (TEM). The detector doesn’t need a significant amount of elec- tronic processing or power sup- ply, Chris says, adding, “This technology could be easier to integrate into other detection technologies without impacting them too significantly.”

Chris cautions that it’s not a silver bullet, but says the tech- nology would be able to integrate into other detection technologies without impacting them too significantly.

The detector must be able to detect a common homemade explosive called a FOx (fuel/oxidizer) mix, made by mixing hydrogen peroxide with fuels, says Chris Brotherton (6633). The next step, he says, will be to work with an industrial partner to design an overall system that is faster and can be mass produced.

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Sandia 401(k) plan scores well against Wall Street Journal indicators

It’s a good idea to periodically monitor your 401(k) plan savings to ensure you’re on the right path toward building that hoped-for nest egg for retirement. Are you saving enough? Have you sufficiently analyzed your investment choices? Are your investments adequately diversified to mitigate risk? And, do you understand the fees you’re being charged?

The Wall Street Journal reported in January 2013 under the headline, “How Good Is Your Company’s 401(k),” that employees should evaluate their company’s 401(k) plan to determine their best option for financing their retirement.

Using indicators that scored things such as the level of fees, the quality of the investments offered, and the level of the company match, the newspaper gave 401(k) plans either a green light (try to max out your 401(k); yellow light (after contributing enough to get the match, comparison shop for a better deal in an IRA or annuity); or red light (get the match, then put your other savings elsewhere).

Sandia’s plan scored squarely within the green light category. “Sandia’s 401(k) plan scores very well across all the different categories,” says Kim Sawyerr, Deputy Laboratories Director & Executive VP for Mission Support and chair of Sandia’s Investment Committee. “We work hard to ensure we provide employees with a quality plan that will help them reach their retirement goals, so we’re certainly not surprised that our plan scores so well.”

Go! Go! Go! Sandia 401(k) gets the green light all the way

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<td></td>
<td>■ T. Rowe Price Large-Cap: 0.59%</td>
<td>$0.8%</td>
<td>$0.8%</td>
<td>$0.8%</td>
</tr>
<tr>
<td></td>
<td>Small-Cap:</td>
<td>International: &lt;0.8% Bond: &lt;0.45%</td>
<td>Large-Cap: 0.6 – 0.9%</td>
<td>Large-Cap: &gt;0.9%</td>
</tr>
<tr>
<td></td>
<td>■ DFA US Small-Cap: 0.37% International:</td>
<td>0.8 – 1.1% Bond:</td>
<td>0.85 – 1.1% International:</td>
<td>1.1% Bond: &gt;0.6%</td>
</tr>
<tr>
<td></td>
<td>■ BlackRock All-Country World Index: 0.10%</td>
<td>0.85 – 1.1% International:</td>
<td>1.1% Bond:</td>
<td>&gt;0.6%</td>
</tr>
<tr>
<td></td>
<td>Bonds:</td>
<td></td>
<td></td>
<td>0.45 – 0.6%</td>
</tr>
<tr>
<td></td>
<td>■ SSgA Bond Market Index: 0.12%</td>
<td></td>
<td></td>
<td>0.45 – 0.6%</td>
</tr>
<tr>
<td></td>
<td>■ Fidelity Interest Income Fund: 0.22%</td>
<td></td>
<td></td>
<td>0.45 – 0.6%</td>
</tr>
<tr>
<td>Cost of target-date funds</td>
<td>BlackRock LifePath funds are index-based, with an expense ratio of 0.22%</td>
<td>Fee is less than 0.6%</td>
<td>Fee is 0.6% to 0.9%</td>
<td>Fee is above 0.9%</td>
</tr>
</tbody>
</table>

At the end of 2012, about 11,700 Sandians and retirees had $2.3 billion invested in the 401(k) plan, administered by Fidelity Investments. Eighty-three percent of on-call Sandians were participating in the plan, meaning 17 percent chose not to put money into the 401(k) plan and take advantage of the company match. Of the participants, 75 percent were also eligible for Sandia’s Retirement Income Plan, a defined benefit pension plan, and 25 percent were eligible only for the 401(k) plan, but received an enhanced contribution because they were hired on or after Jan. 1, 2009.

“I highly encourage employees to think about saving for their retirement as early as possible in their careers,” Kim says. “Our 401(k) plan, with its low fee investment options and company match, provides an excellent way to save that nest egg.”

The table that accompanies this story (see below) provides a closer look at how Sandia scored against all six indicators provided by The Wall Street Journal.

Total expenses:

Green light criteria: Under 1 percent — preferably no more than 0.75 percent

On an annual basis, Sandia’s 401(k) plan participates in a defined contribution fee survey conducted by CEM Benchmarking. According to the survey, which considers costs such as the cost of the available investment options and administrative expenses, Sandia’s 401(k) total plan expenses average 0.41 percent.

A national survey of 803 households conducted in December 2010 for the AARP (Continued on next page)
found that 71 percent reported they were unaware of paying any fees on their 401(k). The Department of Labor provides an example of how fees can affect one’s retirement savings. The DOL example assumes a beginning balance of $25,000 that grows with an annual average return of 7 percent, without any additional employee contributions. With an annual fee of 0.5 percent, the $25,000 would grow to nearly $227,000 over 35 years. But with an annual fee of 1.5 percent, the $25,000 would grow to only $163,000, a difference of $64,000, or 28 percent. The example shows how even a difference of 1 percent in fees can have a big effect on the amount of funds available for retirement.

Beginning in 2012, Department of Labor regulations require that Participant Disclosure Notices be provided to employees annually. This notice provides information related to fees and can be accessed on NetBenefits under “Plan Information and Documents.” Sandians recently received the notice by either email or hard copy from Fidelity.

Maximum company match:
Green light criteria: At least 3 percent of pay. Sandia matches 2/3 of the first 6 percent of employee contributions into the 401(k), or 4 percent. That means if an employee contributes 6 percent of his or her pay to the plan, the 4 percent match brings the total contribution up to 10 percent. As an example, an employee with a salary of $70,000 who contributes the full 6 percent, or $4,200, would receive a $2,800 company match each year.

In addition to the company match, employees hired on or after Jan. 1, 2009, are also eligible for an enhanced company contribution to the 401(k) plan since they are not eligible for a pension. The enhanced contribution provides employees an additional company contribution of 6 percent of pay. That means if an employee contributes 6 percent of his or her pay to the plan, the 4 percent company match plus the 6 percent enhanced contribution brings the total contribution up to 16 percent. After 15 years of employment, the enhanced contribution increases to 7 percent. Pension-eligible employees receive only the company match and not the enhanced contribution.

Access to company match if you leave:
Green light criteria: Immediate vesting.

Sandia has immediate vesting for the company match, employee contributions, and associated earnings. Separately, for employees hired on or after Jan. 1, 2009, the enhanced contribution portion of their account and any associated earnings will vest after they are credited with three years of vesting service. If the employee terminates from Sandia before completing three years of vesting service, the nonvested account balance will be forfeited.

Variety and quality of investment choices:
Green light criteria: Target-date funds, plus at least 5 to 10 decent funds in a variety of asset classes, and Sandia offers target-date funds, plus 13 funds in a variety of asset classes. The funds range in risk, return objectives, and investment strategies to provide employees with an opportunity to create diversified portfolios to accomplish their retirement savings objectives.

With the target-date funds, employees choose the fund with the year that most closely matches the employee’s anticipated retirement year. The target-date funds are pre-mixed diversified investment portfolios that adjust in risk over time as employees approach retirement.

Currently, Sandia offers 9 funds ranging from the BlackRock LifePath Retirement Fund for those currently in retirement to the BlackRock LifePath 2050 Fund for those reaching retirement age in 2059.

Cost of stock and bond options:
Green light criteria: Large-Cap Equities <0.60 percent; Small-Cap Equities <0.85 percent; International Equities <0.80 percent; Bonds <0.45 percent.

Sandia offers low-cost options that meet the green light criteria across all the asset classes mentioned (for specific investment options, visit NetBenefits at www.netbenefits.com or www.401k.com). The percentages listed above are expense ratios. The expense ratio is the total annual cost of a fund expressed as a percentage of the balance in the account and can include costs such as investment management fees, administrative costs, recordkeeping expenses, and other operating expenses.

Cost of target-date funds:
Green light criteria: Fee is less than 0.6 percent. The cost of Sandia’s target-date funds, also called “LifePath Funds,” is 0.22 percent.

Investment Advice:
In addition to scoring well against The Wall Street Journal indicators, Sandia’s 401(k) plan recognizes that investing in retirement cannot be complex and confusing and that many employees would like help with their 401(k)’s. Since 2010, Sandia has offered investment advisory services from Financial Engines, an independent, third-party company. Financial Engines acts as a fiduciary. This means that Financial Engines is legally obligated to offer advice that is in the best interest of the participant and is liable if it fails to do so.

Each year, generally in October, the user can login to Financial Engines and an independent, third-party company, Financial Engines sends out a Retirement Evaluation to each Sandia 401(k) participant that provides feedback based on the plan participation of the participant. Participants can log into the site and click on the Financial Engines link. “Whether to participate in a 401(k) program is an individual decision, based on each employee’s particular financial needs, risk tolerance, and retirement objectives,” says Jane Farris, senior manager of Pension Fund, and Savings Plan Management. “The results of the study should help assure Sandians that they have a good savings plan available to them.”

Undergraduate and graduate students in nuclear engineering from Texas A&M University recently visited Sandia to learn more about employment opportunities at the Labs. After welcoming remarks and a Sandia overview by Center 5400 Director David Reese, the group toured major facilities in Tech Areas 1 and 5, including the Centrifuge Complex, seen in the photo at left. After the tours, the students heard directly from a panel of hiring managers about what it’s like to work at Sandia. During that session, Recruiting team lead Roberto Archuleta (1555–3) also provided information about Sandia’s Student Intern programs, Graduate Study programs, and employment in general. In the photo at left, Roberto, third from right, joins the student delegation as Ed Romero, Mechanical Environments Dept. 1554, at left, explains the work at Sandia’s large centrifuge. TAMU is a Sandia Campus Executive school. The Campus Executive program was established in 1997 as a way to partner with universities to conduct leading-edge science, hire the most accomplished scientists and engineers, and develop strategic collaborations in focused research areas. Sandia executives, acting as ambassadors, are paired with top university officials, usually deans of engineering, at schools that have synergistic research interests and capabilities with Sandia. This program enables the campus executive to deliver a coordinated message to educate key university personnel regarding the programs being put in place to mutually benefit Sandia and its strategic university partners. (Photo by Randy Montoya)
A nyone who’s ever come home from vacation to find a home partly destroyed by a leaking roof, broken water line, or backed-up sewage knows the horror of drywall replacement, rotted rug ejections, mold tests, and other reconstruction measures that force life as we know it to a halt.

The difficulties are even larger when a commercial or government workplace is struck by disaster. Employees usually vacate the premises or wait for help. Little gets done.

Self-reliant buildings
But imagine a building resilient enough to allow people to continue their daily tasks even while an emergency is in progress. The self-reliant building might have its own small electrical generating system to maintain lights and computers during a power outage, employ mobile communications, maintain compartmentalized clusters of rooms to prevent water damage in one sector from affecting others, shatterproof windows to minimize hazards from imploding glass, and sufficient electronics to quickly pinpoint a trouble spot.

For obvious reasons, increased building resilience in the face of hurricanes, earthquakes, terrorism, or cyber-attacks has been a major national security focus over the past decade.

Such resilient buildings not only would be less susceptible to damage and work interruption but could become community gathering places in times of general crisis, according to a recently published Sandia paper, “Resilience certification for commercial buildings: a study of stakeholder perspectives,” published in Environment Systems and Decisions on March 13, 2013.

But it won’t be easy to secure voluntary adoption by industry and construction companies if the wrong justifications are presented, says lead author Barbara Jennings (6924).

Expecting industry to act, for example, merely because “it’s the right thing to do” came out lowest (3 votes) in a questionnaire presented to 15 industry representatives.

The highest number of respondents were motivated by business reasons. These included increased revenue (10 votes), better competitive edge (9), and quicker, cheaper recoveries (9) from more efficiently handling a disruption. The upper middle ground was held by “decreased insurance premiums” (8) and “tax incentives” (7), while the lower middle ground included more problematic benefits: “Increased chance of receiving financing or lower finance rates” and “ability to charge higher lease rates due to increased attractiveness of the building to tenants” (both 5).

Five concepts
While the respondents were generally favorable to the resilience concept, they found it daunting to plow through the government forms and language necessary to apply for sizable tax credits to offset the increased building costs.

The paper proposes five concepts to make the concept of resilient buildings real to the construction, design, insurance, and building owner communities.

Most imaginatively, the authors (who include Eric Vugrin and Deborah Belasich, both 6921) suggest that program sponsors collect stories and images that demonstrate resilience during alarming times and use these as proxy incidents to motivate others who had not experienced disasters themselves.

They also suggest government-based incentives, public-private partnerships, training and education programs, and simple, clear explanations of the federal governments’ multiple programs “to minimize confusion by describing the different role each plays.”

LAST HOUSE STANDING — In this iconic photo by Houston Chronicle photographer Smiley N. Pool, the last house standing on the waterfront at Gilchrist, Texas, in the wake of 2008’s Hurricane Ike demonstrates the value of engineering buildings to withstand the forces to which they are likely to be exposed. (PHOTO © Houston Chronicle. Photo used with permission)
Onsite reps demystify complex world of health insurance

By Nancy Salem

Often the most painful part of an injury or illness is the aftereffects: A mountain pile up from hospitals, clinics, physicians, therapists, anyone who helped in a time of need. Do you pay or wait? Then come insurance forms with thumbs up or down on claims. Opening those envelopes is downright scary.

“Health insurance can get complicated,” says Deborah Nunez, manager of Benefits Dept. 3332. “We want resources available onsite to help members with claims issues and understanding benefits.”

Deborah says Sandia is taking steps to help employees engage insurance providers and figure out every-thing from out-of-pocket expenses to the most afford-able way to have, say, knee surgery.

Blue Cross Blue Shield of New Mexico (BCBSNM) has an onsite customer advocate, Christina Hart, who is at the Labs two days a week, Monday and Thursday. Hart can walk people through their claims, explain benefits, look up providers, learn about preventive services, chat online with the medical bills arrive, and keep arriving.

“There’s a slew of information,” she says.

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“One of the biggest questions with consumer-driven health plans is, ‘You tell me I need to shop for services, but I don’t know how to do that. I don’t know how much it costs. Sometimes a provider won’t tell me. Do I have to call every provider?’ This is what these tools are trying to help members do,” Deborah says.

“The UHC and BCBS websites have cost estimators that analyze the four ‘Ps’ of planning for care: procedure, provider, place, and price. ‘It helps you determine approximately what your price might be for a procedure. There are differences in pricing and you can make choices that affect your out-of-pocket expenses,” Deborah says. “The insurance providers are offering more services to help people make decisions. It’s more interactive.”

Sandsia’s onsite customer advocate for United Healthcare, says the UHC website has a variety of tools to help people understand the insurance claims process. “There’s a slew of information,” she says.

MIA SCOFIELD, the onsite customer advocate for United Healthcare, says the UHC website has a variety of tools to help people understand the insurance claims process. “There’s a slew of information,” she says.

Scofield says working directly with health plan members has been rewarding. “I can make a difference through personal interaction,” she says. “I can see the impact of my services immediately.”

Hart says she works with more than a dozen people a day. “We are here for you,” she says. “Come in and we’ll help you out.”

Close at hand

Sandia’s onsite health insurance advocates encourage members to ask questions and get tips on using website tools. Here’s how to reach them:

Mia Scofield, United Healthcare
Office: Bldg. 832, Rm. 338, Monday-Thursday, 7 a.m.-3:30 p.m.
Phone: 925-8301
Email: mia_i_scofield@uhc.com
Website: www.myuhc.com

Christina Hart, Blue Cross Blue Shield of New Mexico
Office: Bldg. 832, Rm. 33A, Mondays and Thursdays, 8 a.m.-4 p.m.
Phone: 284-8669
Email: christina_hart@bcbsnm.com
Website: www.bcbsnm.com

Kaiser PERMANENTE
Alison Huff, Kaiser (California)
Office: Sandia/California Bldg. 925, every other Thursday, 9 a.m.-12 p.m. (by appointment)
Phone: 925-294-2700
Email: Alison.C.Huff@kp.org
Website: www.kp.org

Sandsia’s 13th Habitat House halfway through build schedule

By Stephanie Hobby

Every Friday and Saturday from March until June, Sandia Labs employees, family members, retirees, and contractors meet at the Habitat for Humanity build site to bring another family closer to the dream of owning their own home. The future homeowner, Zulema Hernandez, is pictured in the center left in the photo below. Hernandez, in the work apron and cap, is joined by members of the Div. 2000 work group including VP Bruce Walker in center rear. The division 2000 volunteers worked on Friday, April 12, and Saturday, April 13, to frame doors and windows and help with layout. This project marks the 1.1th home that Sandia has built for Habitat for Humanity. The dedication is scheduled for Saturday, June 29. If you are interested in volunteering, contact Patty Zamora (3652) at 844-2416.

(Photos by Nancy Galadzen, volunteer coordinator for Habitat for Humanity)
No excuses
Three schools offer Sandians onsite master’s programs

By Nancy Salem

Sonia Martinez has been on a fast track since joining Sandia in 2005 in clerical support. After lots of focused learning, she’s now a software applications engineer.

Sonia (9548) says she doubts she would have advanced as quickly without having earned a master’s degree in national security from the University of New Haven (UNH), which offers the program onsite at Sandia. “The national security program gave me a firm foundation to learn and grow professionally,” she says. “After completing the program I got the opportunity to move into a professional position in this new subject area, which I firmly believe would not have happened if I hadn’t pursued my master’s degree and the rich education I received from UNH.”

New Haven is one of three schools offering master’s programs onsite at Sandia. New Mexico State University (NMSU) offers a master’s in business administration (MBA) and Stevens Institute of Technology of Hoboken, NJ., a master’s in systems engineering.

Charline Wells, senior manager of Corporate Learning & Professional Development Dept. 3520, says the onsite schools are an important part of Sandia’s continuing education program. “We want to make it easier for Sandians to further their education,” she says. “From an adult learning perspective, we want to eliminate barriers that get in the way of people learning so that they can increase their knowledge to advance their career, and so Sandia can best serve the nation. We want people to continue their education and get a degree in an area important to Sandia’s mission.”

There are about 60 people in the onsite master’s programs at any one time, says University Programs administrator Bernadette Montano (3520). Sandia tuition assistance provides regular employees who qualify up to $6,000 per calendar year and cover most of the cost of getting a master’s degree at state schools and helps with the price of higher education at other schools.

Eleven schools will be represented at the 2013 Sandia Learning Expo (see box at far right). The three-day event June 11-13 will provide information on an array of educational opportunities. “This event is worth your time,” Bernadette says. “You can talk directly to university representatives about educational options and find out what courses and programs are available onsite at Sandia and offshore at universities.”

Benefits of a business degree

The onsite NMSU program, which has been in place since 2008, offers an opportunity to earn an MBA in two years. It’s a cohort program, meaning a class of 18-20 students goes through together, starting and finishing at the same time. “An outcome we have observed is the majority of graduates who completed their MBA through the NMSU program have qualified for other opportunities within the Labs and transferred into management positions,” Bernadette says. “Some have been promoted.”

The program includes two courses per semester, one taught one evening a week in Albuquerque and the other online. Charlaine says a business degree can round out the career of a Sandia manager or individual contributor. “For people who interact with government or corporations it is useful to understand, from a business perspective, where your customer is coming from so you can relate the program to their needs.”

Participants have indicated that they learned more going through the program with a cohort. Not only are they able to get a traditional MBA education, they get a better understanding of how to apply that knowledge across Sandia through the experiences of others in the program. They also build their Sandia network with fellow students ranging from OAs to senior managers.

Wider view of national security

UNH, based in New Brunswick, N.J., has its national security degree program since 2002. It started at Sandia/California and in 2005 moved to Sandia/New Mexico. In 2010 the program relocated to the Kirtland Air Force Base (KAFB) Education Center so base personnel can participate.

New Haven is one of 13 US universities with a national security program. Students can earn a graduate certificate requiring 12 credits or a master’s degree with 36. They complete the program at their own pace rather than in a cohort setting, generally in two to five years. Most of the courses are offered onsite, with a few online.

The dozens of classes range from “The Economics of National Security” to “Information Systems, Threats, Attacks, and Defenses.” “All of the professors who come out here to teach these courses are experts in their field,” Bernadette says. “They’re not just teaching out of a book. These are people who have held high positions in the government.”

Charline says taking classes with students from KAFB “gives Sandians exposure to other security types of interests that could work for them.”

“It’s not just focused on Sandia but rather looks to the larger spectrum,” she says.

Sonia says the program gave her an insight into how national security programs work and how those principles are directly related to the work we perform here at the Labs.”

“The convenience of attending evening classes on Sandia campus and having the flexibility to complete a portion of my degree online was amazing,” she says.

A nice lineup of programs

Stevens has been onsite three years offering a certificate program and master’s degree in systems engineering with four concentrations: software engineering, systems engineering, security program management, and advanced systems engineering. Students work at their own pace to complete the program in four day-long sessions over two months.

“The program can go faster because students are in class a lot more often each week,” Bernadette says. “It’s not just one evening a week.”

Heather Kramer (2136) earned a master’s in systems engineering from Stevens in 2010. She has received several promotions and is now an integrated risk manager and a technical integration lead in Department 2100.

“Each of the positions has built on the knowledge gained through the Stevens program, each with increasing levels of responsibility, complexity, and visibility that tie directly to my education through Stevens,” she says. “It was fantastic to get a master’s onsite. It allowed me to be engaged and working with world-class faculty but not having to leave Sandia.”

Charline says the three onsite programs line up nicely with the goals of the learning programs offered to Sandia’s schools in the region important to Sandia’s mission.”

Learn about learning at the 2013 expo

Education offered through Sandia will be highlighted at a three-day expo June 11-13. “People can come to the fair and sample classes or spend a little time talking with university representatives about available education programs,” says Charline Wells, senior manager of Corporate Learning & Professional Development Dept. 3520.

The first day of the expo, in Bldg. 8560, from 10 a.m. to noon, showcases internal training courses and programs offered to Sandia staff. Table topics include Lean Six Sigma, Security, and systems engineering. “They enhance the skills that Sandia brings to our mission,” she says.

In any given year, 400-450 Sandians participate in the Tuition Assistance Program and about 50 in Special Degree Program at the University of New Mexico, University of Texas at Dallas, University of St. Thomas, University of New Haven, University of New Mexico, University of Arizona, Central New Mexico Community College, and New Mexico Institute of Mining & Technology.

“Providing employees the opportunity to continue to learn through accredited formal education programs always serves the Labs’ best interest,” Charline says. “Renewing and keeping employees at the top of their game helps keep our focus at the top of its game.”

For more information about the awards see hear://learningexpo.sandia.gov/
Sandia helps kids who conquered adversity to get a high school diploma

By Nancy Salem

Abraham Palacios and Misty Osterholt had to grow up fast.

Abraham was three months old when his father abandoned the family. His mother tried to make ends meet, but the bills piled up. "Her check was not enough to pay the expenses," Abraham says. "I had to go to work or risk losing our house.

"I struggled with the problems in my family but the adversity motivated me to work harder and strive for a degree," Misty says. "I didn’t want to have the life that my parents did.

Abraham found jobs in his teens to keep the family afloat. His income became even more important when his mother fell ill and couldn’t work. "I worked in restaurants and hamburger places," Abraham says. "I worked long hours and supported the family."

Misty lost a 2-month-old sister to Sudden Infant Death Syndrome, sending her parents into a downward spiral of alcohol and drug abuse. "My parents couldn’t care for me so I moved in with my grandmother," Misty says.

At times she tried to live with her mother or father, but the environment was unhealthy so she returned to her grandmother. At one point Misty ended up in foster care.

Her father died in prison when Misty was a sophomore in high school, and she became further estranged from her mother, who also spent time in jail. Abraham and Misty persevered through the hard times and graduated in May, Abraham from Independence High School and Misty from La Cueva High School. Abraham is headed to Central New Mexico Community College and Misty to the University of New Mexico.

Both will have help from Sandia and Lockheed Martin. They are among this year’s 24 Thunderbird Award winners who received $1,500 in recognition of their exceptional ability to overcome significant personal challenges on the path to high school graduation.

"It has been said that adversity builds character," Kim Sawyer, deputy Laboratories director and executive VP for Mission Support, told the honorees at the 19th annual awards ceremony on May 8. "I believe that to be true and these young people certainly embody that maxim.

Stories of courage

Family, friends, school principals, advisers, and members of the winners attended the ceremony at the Embassy Suites. Also on hand were representatives of the New Mexico congressional delegation, members of the Albuquerque Public Schools board, and superintendents Winston Brooks of APS, Allan Tapia of Bernalillo Public Schools, and Rom Marquez of Belen Public Schools.

No one in the audience was untouched by the stories of courage. There was Karen, who had two major hip surgeries that kept her out of school for long periods of time. Raquel took care of herself and raised her younger siblings in the absence of responsible parents.

Yuri attended nine different schools and lived in 16 different homes starting in second grade. Ismael rose from the impoverished background to become an honor student.

Cheyene grew up with a hearing impairment that affected her speech and led to severe bullying. "Their stories, both heartwarming and amazing, demonstrate the enormous character each of them showed to persevere in the face of adversity," Kim said. "You are an inspiration to everyone here."

College and careers

Each of the students is headed to college with a career goal. Majors range from photography to engineering to medicine. Misty plans to study architectural engineering. She says she would not have graduated without the support and stability provided by her grandmother, who eventually won guardianship of Misty.

"I struggled with the problems in my family but the adversity motivated me to work harder and strive for a degree," Misty says. "I didn’t want to have the life that my parents did." Abraham will study heating, ventilation, and air conditioning, or HVAC, at CNM and hopes in the future to go into law enforcement. "I worked long hours but always tried to find a way to make time for my studies," he says. "I would stay awake at night to get work done."

Misty, Abraham, and the other recipients all said they are excited about college and grateful to Sandia and Lockheed Martin for the Thunderbird Award.

"It’s awesome," Misty says. "I’m going to be in school a while and this money will help out tremendously."

Kim said Sandia wishes all the recipients continued success.

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