

International scientists weigh new definition for kilogram

Change should have little impact on Sandia, nuclear weapons complex



KILOGRAM UNDER GLASS — Mechanical engineer Hy Tran (2541) examines a kilogram sample in a mass comparator at Sandia's Primary Standards Laboratory. The international community is considering alternative means of defining the kilogram. (Photo by Randy Montoya)

By Michael Padilla

The kilogram is losing weight and many international scientists agree that it's time to redefine it.

Scientists are hoping to redefine the kilogram by basing it on standards of universal constants rather than on an artifact standard.

The International Prototype Kilogram (IPK) or "Le Grand K," made in the 1880s, is a bar of platinum-iridium alloy kept in a vault near Paris.

"The idea is to replace the single master kilogram with something based on physical constants, rather than an artifact that could be damaged accidentally," says mechanical engineer Hy Tran (2541), a project leader at the Primary Standards Laboratory (PSL) at Sandia.

Of the seven units of measurements in the International System, or SI, the kilogram is the only base still defined by a physical object. In addition, copies of the kilogram have changed over time by either gaining or losing weight as compared to the standard kilogram.

The purpose of redefining the kilogram is based on risk reduction, says Hy.

"In the long term, the redefinition — especially if performed correctly — is beneficial because of risk reduction and because it may enable better measurements in the future," he says.

Definition only thing to change

By replacing the master kilogram — Le Grand K — with a unit based on physical constants, researchers at multiple laboratories and at national measurement institutes could establish traceability, he says.

Hy says the kilogram will remain the kilogram; it's

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Tom Hunter hosts Feb. 6 all-hands meeting

Sandia's first all-hands meeting of 2008 will be Feb. 6, 9-10:30 a.m. in the Steve Schiff Auditorium. Labs Director Tom Hunter will speak to employees about the current lab environment and the changes in store over the next few years as the Labs engages a broader set of customers and expands its role in the national security community. Watch the *Sandia Daily News* for more details.

Tom will paint a picture of a future that looks dynamic, a future where Sandians will be working on new challenges with new partners, and collaborating with industry, universities, and other national labs and government agencies to serve the nation.

During the meeting Tom will also talk about some of the Labs' more immediate challenges: budget planning, laboratory size, benefits, and the uncertainties of an election year. Most of the meeting will be devoted to questions and answers, so employees will have an opportunity to ask their own questions.



TOM HUNTER

Sandia LabNews

Vol. 60, No. 3

February 1, 2008

Managed by Lockheed Martin for the National Nuclear Security Administration



Library transformation process moving forward

Many temporarily suspended services restored

By Neal Singer

Many of the changes planned for the Sandia Technical Library are in process and many of the temporarily suspended services have been restored, says Center 9500 Director David Williams, who believes he and his team are "turning the corner to a new and improved Sandia Technical Library."

David is charged with overseeing a library transformation he expects will create an e-journal collection better keyed to ongoing Sandia needs and permit faster availability for other reading materials.

He also foresees technological advances that will better keep the library's metaphorical finger on the pulse of Sandia research, so that the most appropriate materials will be available at the right time. The point, he says, is to create a better balance of "high touch" and "high tech" in delivering services.

"The transformation is designed around the recognition that information is the lifeblood of the Labs," he says. "Researchers need ready access to library materials to do their work. And we must manage all the data that we generate to learn which journals and documents researchers most need available."

Library advisory board formed

To ensure that voices of library users are heard, a library advisory board drawn from a wide swath of Sandia organizations has been established by David with the support of VPs Rick Stulen (1000) and Joe Polito (9000) to help steer the Sandia library through the rapids of modernization.

The board, helmed by Center 1100 Director Julia Phillips, carries a 10-person roster

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"The transformation is designed around the recognition that information is the lifeblood of the Labs."

— Center 9500 Director David Williams

Sandia workforce restructuring update: 'Impacted' employees notified in January

As of Feb. 1, 37 impacted positions remain of the 110 impacts announced in a Dec. 11 bulletin to employees from Labs Deputy Director John Stichman. The bulletin said as many as 65 involuntary regular employee separations could result due to indirect cost reductions and changing work requirements in FY08.

Attention, movement of impacted employees to funded positions, and releases of some temporary employees have resolved many of the impacts.

Since then attrition, movement of impacted employees to funded positions, and releases of some temporary employees have resolved many of the impacts. The number of contractor positions has been reduced, as well.

Managers were asked to notify by the end of January those regular employees in their departments who are "impacted" — meaning they are in positions being eliminated.

The 37 remaining impacts include both indirect- and direct-funded positions.

By the middle of April, all remaining impacts are expected to have been resolved through internal movement or layoff, says Human Resources Director BJ Jones (3500). Sandia's policies and labor agreements include provisions for severance pay for those employees who cannot find alternative work within the Labs.

All hires under review

Sandia managers are being asked to consider impacted employees first when posting and filling positions, says BJ.

All internal and external hires will be reviewed to make sure affected regular

(Continued on page 4)



Sandia, ORNL team to lay groundwork for superfast exascale computer

A joint Institute for Advanced Architectures newly launched at Sandia and Oak Ridge national laboratories is charged with laying the groundwork for an exascale computer. A thousand times faster than a petaflop, it would perform a million trillion arithmetic calculations per second. Story on [page 5](#).

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That's that

I got an email the other day from Ken Smith (5346) that raised some alarm bells for me. He wrote that his colleague Rick Heintzelman (5353) will be celebrating his 13th birthday this month. Ken wondered if I'd be willing to take note of it here, since, after all, we don't employ that many 13-year-olds. Well, I was taken aback, to say the least. I mean, I knew we had a pretty impressive student internship program - it brings in hundreds of talented young people to the Labs every year. But 13-year-old Sandians? C'mon. That's getting awfully close to Jesuit territory. You know their adage: "Give me a child until he is seven and I will give you the man."

Sure, we want to foster Sandians for life, but shouldn't we at least let these kids finish middle school first? I was about to sputter all of this in an indignant email to our internships program folks when Ken sent me a follow-up message. "Oh," he wrote. "I forgot to mention: Rick's birthday is Feb. 29."

Never mind. (To all of you Sandia February leap year teenagers out there: Happy birthday!)

* * *

That reminds me of an old gag . . . Guy goes to see his doctor. Doc says, "I've been your friend and physician for 35 years. I think I owe you the straight truth, and it's not good. You've got one month to live. The guy sags into a chair, puts his hands to his face and mutters quietly, "One month, one month. 30 days." The doc holds up a wagging finger and says, "Uh uh uh . . . this is February."

* * *

I've been exchanging emails lately with a very nice lady named Nancy Merritt. She has an interesting proposition that will . . . well, here, let her tell it: "Dear Mr. Murphy: My Dad [Warren George Merritt] began with SNL on Feb. 2, 1948, and loved his career there for 35 years, barely making it [to retirement] before succumbing to radiation exposure-related leukemia (he worked on the Manhattan Project). During the time I lived in Albuquerque (1959 to 1969) I joined my parents in their love for all things New Mexican! Consequently, in the summer of 1969, I gave my parents a beautiful large vase, imprinted with the *Albuquerque Tribune's* front page headlines from the day of the moonwalk. Now my parents are gone, and my sister and I have no offspring. I would like to offer this vase to anyone who would treasure it and who would pay the shipping costs to have it sent to them from my home in Washington, D.C. May I advertise this in the *Lab News*? Please let me know!"

Being a long-time space buff I was intrigued by Nancy's note. This item sounded to me like a really special Space Age collectible. I asked Nancy for a photo (right) and some information on how to get in touch with her. She replied: "If anyone interested could write to me as to the specifics of why they would like the vase, I would choose among those emails. Please have them write on the topic line: VASE. My email is NMerritt202@aol.com."

So there you are Sandians - get in touch with Nancy and let's keep this unique, Antiques Roadshow-worthy artifact in the Sandia family. (P.S. If you get the vase, let me know.)

See you next time.

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



Drug testing update

Start date uncertain, other details could change

It could be several months before Sandia is required to implement an expanded random drug testing program for Sandia clearance holders.

A Dec. 5, 2007, *Lab News* article announced that all Sandia employees and contractors who hold Q- or L-level security clearances soon will have a 50 percent-per-year chance of being randomly selected for a drug screening.

The article, based on information from DOE, also said the new requirements would apply as soon as DOE directs the Labs to implement the policy. Testing was to begin as early as January.

Recent discussions with DOE officials, however, are giving the sites a better picture of how and when DOE expects the policy to be implemented, says Linda Duffy, director of Health, Benefits, and Employee Services Center 3300.

Sandia now anticipates an implementation date that is perhaps several months away, as well as some changes in the way the policy is to be implemented.

Last week, for example, the federal law that describes drug testing at DOE sites, 10 CFR 707, was revised. It now mandates a 30 percent-per-year population sampling for workers in testing-designated positions rather than a 50 percent annual rate, as announced in December. That means fewer Sandians would be randomly selected each year for a drug test. (DOE now considers all clearance holders to be in testing-designated positions.)

Other changes in the policy's implementation are expected, she says, though what details will change and how they will change is unclear.

"As with any major policy change, the devil is in the details," Linda says. "Our discussions with DOE and with other sites are beginning to clarify some things, but we are a long way from settling on a set of complex implementation requirements."

More information about random drug testing is available at <http://ln.sandia.gov/drug-testing>.

- John German

Archimedes palimpsest cracked by researchers

Lockheed Martin a key sponsor of UNM conference on project

During the 13th century, Byzantine monks erased a Greek manuscript and copied religious texts over the erasures. The writings they nearly obliterated were treatises on mathematics, engineering, and hydrodynamics by Archimedes, the leading scientist of the ancient world.

Since 1998, a team at the Walters Art Museum in Baltimore has been working with experts in the latest digital technologies to recover the erased Archimedes



texts. A specially designed high-tech scanner using X-ray fluorescence has made it possible to detect surviving traces of iron in the original ink and thereby render legible virtually all the erased text. The project thus represents an extraordinary coming together of ancient science, medieval manuscript culture, and the very best in modern technology.

The Institute for Medieval Studies at the University of New Mexico (UNM) is hosting a weekend seminar about this important work. The seminar is free and open to the public. The talks open at 7 p.m. Friday, Feb. 15, with an introduction to the project by its director, William Noel of the Walters Art Museum in Baltimore, titled "Eureka! The Archimedes Palimpsest."

During Saturday's talks, which run from 9:30 a.m. to 4:15 p.m., several noted experts will discuss various aspects of the Archimedes project. All presentations will be in Rm. 101, Woodward Hall, UNM. For more information, visit the Institute website at www.unm.edu/~medinst or call 505-277-2252.

Sandia LabNews

Sandia National Laboratories

<http://www.sandia.gov/LabNews>

Albuquerque, New Mexico 87185-0165
Livermore, California 94550-0969
Tonopah, Nevada • Nevada Test Site • Amarillo, Texas •
Carlsbad, New Mexico • Washington, D.C.

Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin company, for the US Department of Energy's National Nuclear Security Administration.

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Classified ads 505/844-4902

Published on alternate Fridays by Media Relations and
Communications Dept. 3651, MS 0165



Retiree deaths

Philip J. Federico (age 59)	Sept. 29
Norman Richardson (88)	Oct. 3
Earl G. Coffee (88)	Oct. 5
Oswald B. Tjeltweed (83)	Oct. 8
Geraldine Guzman (75)	Oct. 8
Wilbert A. Sherman (90)	Oct. 19
J. Philip Lapoint (92)	Oct. 19
Walter J. Norris (79)	Oct. 20
Ruben C. Kilpatrick (87)	Oct. 20
Ralph E. Clark (88)	Oct. 20
Dennis E. Murphy (88)	Oct. 21
Theodore E. Smart (87)	Oct. 21
William A. Cole (93)	Oct. 23
Frances G. Bertolucci (93)	Oct. 24
George J. Janser (89)	Oct. 24
Delfred M. Olson (79)	Oct. 26
Arthur J. Roth (87)	Oct. 26
Barbara V. Ruminski (90)	Oct. 27
J.M. de Montmollin (87)	Oct. 27
Harold L. Myers (79)	Oct. 30
Jerome F. Durrie (89)	Nov. 1
Reynolds R. Moore (82)	Nov. 4
Lloyd A. Wheeler (88)	Nov. 6
John E. Stang (81)	Nov. 7
Rachel C. Johnson (66)	Nov. 11
Earl R. Johnson (91)	Nov. 12
James E. Simpson (82)	Nov. 12
Tommy M. Simpson (63)	Nov. 16
Charles J. Still (73)	Nov. 21
Jack P. Hubner (84)	Nov. 25
Chris O. Padilla (78)	Nov. 25
Jack W. Reed (84)	Nov. 30
Willard D. Clark (82)	Dec. 3
Ann E. McIntyre (88)	Dec. 4
Imogene Holmes (81)	Dec. 4

Sandia's Jess rule engine selected by Lockheed Martin for critical role in Navy's DDG 1000 destroyer ship

By Mike Janes

Jess® 7.1a3, a popular rule engine created at Sandia, has been licensed by Lockheed Martin Corporation to play a critical role in the US Navy's DDG 1000 destroyer ships. A rule engine is a software system that helps manage and automate business rules, in this case operating the computer systems of the ship.

According to Greg Harrison, a Lockheed Martin systems engineer, the company chose Jess after extensive and multiple trade studies confirmed the software's ability to interface with the information in the DDG 1000 knowledge base. "I feel confident that we made the right choice with Jess," says Harrison.

This licensing is significant, says Sandia software licensing manager Craig Smith (8529), because DDG 1000 is one of the biggest Navy programs in the last 20 years. "We are very pleased, given the competition in the marketplace," he says, "especially since we did not submit a bid for this contract. Jess was chosen for its well-known merits."



SANDIA'S RULE ENGINE Jess® 7.1a3 will play a critical role with advanced technologies and features on Navy DDG 1000 destroyer ships, such as the one shown here. (Image courtesy of Northrop Grumman)

Jess was licensed by Lockheed Martin Simulation, Training, & Support (STS), a business unit in the company's Electronics Systems business area. STS is a leader in the development of logistics solutions and military training and simulation, producing air, ground, and maritime systems for customers worldwide.

The Navy's DDG 1000 is a multimission, fleet of destroyer ships. It includes a number of advanced technologies and features, including an integrated power system, dual band radar, integrated undersea warfare system, and advanced gun system. Among other intended uses, Jess will help the DDG 1000 ship domain controller with its alarm management function and reasoning about ship system states for safe operation.

Jess enables software developers to embed intelligence in the form of business rules directly into their Java™ applications. Rule-driven programming, says

Craig, allows software to express real-world concepts in a natural, expressive way that helps business and IT professionals collaborate in bringing enterprise applications to life.

Among Jess' latest features is an integrated development environment (IDE) for rules that increases programmer productivity and enhances collaboration. The IDE is based on the award-winning Eclipse™ platform (www.eclipse.org) and features tools for creating, editing, visualizing, monitoring, and debugging rules.

Jess, says Craig, is the only enterprise-capable rule engine to offer both the convenience of an IDE and an unprecedented level of flexibility and openness that makes it easy for developers to add the power of heuristic rules into applications that run on everything from handheld devices to enterprise servers. Jess supports the industry-standard JSR94 Java Rule Engine API as well as its own rich interface. Jess executes rules written both in its own expressive rule language and in XML.

Jess is licensed commercially and is being used in enterprise applications at dozens of Fortune 500 companies, including many in the finance, insurance, security, transportation, and manufacturing sectors. Sandia also offers Jess licenses to academic and government institutions. Jess (along with the textbook *Jess in Action*) is used as a teaching tool at hundreds of universities around the globe. To learn more about Jess, go to www.jessrules.com.

Sandia California News

The right place at the right time

John Vitko's 33-year career exemplifies service in the national interest

By Patti Koning

Throughout his career, John Vitko (8001) had had the knack of being in the right place at the right time. Now, after more than 30 years at Sandia, including more than five years helping to stand up and operate the Science and Technology Directorate (S&T) at the Department of Homeland Security (DHS), he's decided it's the right time for retirement.

"I made this decision with very mixed emotions," says John. "Sandia has provided me with the incredible opportunity to work on almost every national major technical issue of the last two and a half decades."

His contributions were recognized by DHS Secretary Michael Chertoff late last year, when John was awarded the department's Silver Medal in recognition of his visionary leadership in biodefense and national security.

Rather than rest on his laurels, John already has a second career planned. He's going to follow his passion and seek to become an ordained priest in the Orthodox Church. He plans to enter a seminary program in the 2008 academic year.

While priesthood typically does not follow a career in physics working in the highest levels of national defense, John feels his two pursuits are very complementary. "People think science and faith are opposing beliefs, but theological questions relate to science," he explains. "Science tells us how things happened, but it doesn't explain why."

John came to Sandia in the fall of 1974, fresh out of Cornell University with a PhD in solid-state physics. "I remember returning from the interview at Sandia full of excitement," he recalls. "And as I drove up to Sandia for my first day of work, I thought to myself 'I'm going to be here for the rest of my life — whatever will I do?'"

He joined the physics department and worked on basic and applied research before moving on to systems analysis of solar energy. His next assignment was in the weapons area, where he initiated an effort in



JOHN VITKO

strategic defense about six months before then-President Reagan made his famous "Star Wars" speech.

John's career also included heading up DOE's Unmanned Atmospheric Vehicle (UAV) program as part of DOE's climate change program and comanaging Sandia's first Laboratory Directed Research and Development Grand Challenge, which resulted in MicroChem-Lab. This experience led directly into his role heading the Sandia-wide effort on chem/bio defense.

His role in chem/bio reached beyond Sandia. John coordinated DOE's chem/bio detection program and served as the interface with the Department of Defense. He chaired a National Research Council study on advanced detection and facility protection.

This movement in his career, he believes, matched the movement in the scientific world at large. "If the 20th century belonged to the physical sciences, the 21st century belongs to biological sciences," says John.

In the aftermath of 9/11, he was one of 10 people nationwide tapped to begin structuring the S&T directorate even while the idea of DHS was still being discussed in Congress. He recalls that initially it was a three-month project.

Like being a freshman again

"We all showed up in D.C. without spouses. It was like being a freshman in college again; we were building something from scratch," says John. "The work was all-consuming and we developed an amazing camaraderie."

After DHS was formally established, he was asked to stay and head the biodefense portfolio. His entire career at Sandia, says John, prepared him to take on this critical responsibility.

"I had strong management experience as a result of the different roles I played at Sandia. I was no longer responsible for a piece of biodefense, but the whole thing — most of civilian biodefense outside of medical countermeasures," he says. "The problem is huge and technically challenging and always evolving."

One of the aspects of working for DHS that John found the most exciting and rewarding was the opportunity to contribute to the formulation and implementation of the nation's biodefense strategy. He says he's also proud of the BioWatch program and the strong group of people he assembled to work on the biodefense portfolio.

Pat Falcone, senior manager of Systems Analysis



JOHN VITKO (8001) shares his experiences at DHS in a talk called "Reminiscences and Overview of DHS Bio-Defense Program." His talk ranged from the "wild west" atmosphere of the early days of DHS to the challenges of biodefense and defense. According to John, the biggest challenges are early decision-making and distribution of prophylactic medication. (Photo by Randy Wong)

and Engineering (8110), first met John when he was a staff member doing a rotational assignment in systems analysis. She worked as a manager under him when he was a senior manager leading the Strategic Defense Initiative effort, and they worked together on the Advanced Detection Initiative that laid the groundwork for the Chemical & Radiation Detection Laboratory (CRDL) and other early chemical detection programs.

"Through all these assignments there have been many consistent and noteworthy aspects about working with John," she says. "He is unfailingly gracious and upbeat, always fascinated with key technical details and their implications, and expert in supplying incisive judgment. John is an example of the key reason why it is such a pleasure to work at Sandia: high-quality colleagues. I've learned a lot from John and wish him the best in retirement."

Kilogram

(Continued from page 1)

only the way it will be defined that will change. He says the earliest the kilogram would be redefined is 2011.

"If and when the redefinition takes place, it will be done in such a fashion as to have minimal or no practical impact with other measured quantities," Hy says. "In other words, if it is redefined so as to ensure better than 10 parts per billion agreement — rather than 20 parts per billion agreement — then we will see no major changes immediately."

Based on the current formal definition of the kilogram (the mass of the 1 kilogram prototype) and experimental dissemination to standards labs, the uncertainty (95 percent confidence) in PSL's kilogram is about 40 parts per billion, compared to the IPK.

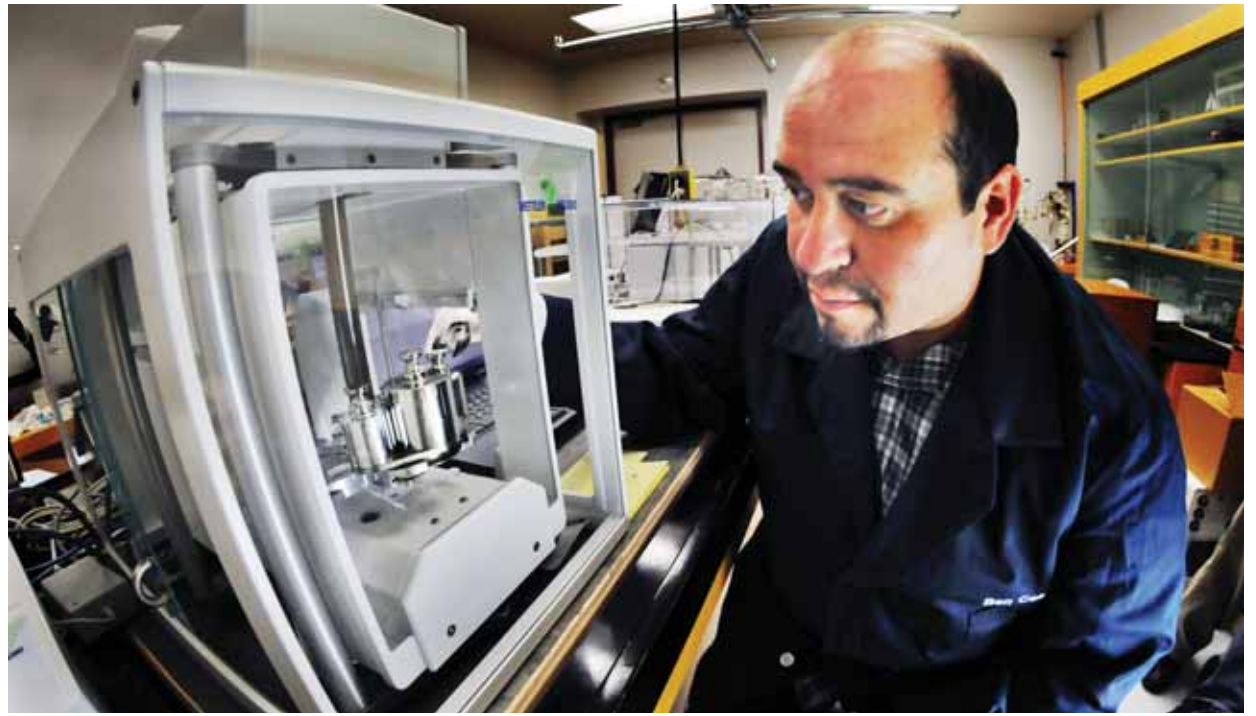
One part per billion is about the ratio of the area of a square 3/32 inch on a side, with respect to the area of a regulation NFL football field (including the endzones, or 120 yards by 53-1/3 yards), Hy says.

The target originally proposed by the Bureau International des Poids et Mesures (International Bureau of Weights & Measures) was to get one of the alternative kilogram definitions, such as the experimental measurement of force on the watt balance (or counting atoms on the silicon sphere), and deriving the kilogram, matched to experimental measurements of the prototype kilogram to within 20 parts per billion.

Resolving the issues

Sandia physicist Harold Parks (2542) agrees that the redefinition of the kilogram is inevitable and says there are a couple of issues that need to be resolved before it's redefined.

"The watt balance method of defining the kilogram makes the most sense for those of us in electrical metrology and so far it is the most accurate," he says. "But other proposals, such as those based on counting the number of atoms in a silicon crystal, are being considered."



WEIGHTY MATTERS — Sandia technologist Ben Casados (2541) looks at kilogram samples in a mass comparator.

(Photo by Randy Montoya)

The watt balance is based on an idea that compares electrical and mechanical power with a high accuracy, he says.

Conflicts between the results of the watt balance and the atom counting experiments will also need to be resolved, Parks says.

"The NIST (National Institute of Standards and Technology) watt balance experiment has achieved the accuracy needed to redefine the kilogram, but the experiment will need to be confirmed by other groups in order for the results to be fully accepted," he says.

Impact to the Sandia community

Hy says redefining the kilogram will have little

impact on the Primary Standards Lab or the broader nuclear weapons complex. The lab develops and maintains primary standards traceable to national standards and calibrates and certifies customer reference standards.

"It should not affect PSL or the complex if the international metrology community ensures that they fully consider the uncertainties, the necessary experimental apparatus to realize the kilogram, and implementation issues prior to agreeing to the redefinition," Hy says.

In preparation for the change, PSL staff members are staying up to date in research in metrology and standards practices. Staff also participate in standards activities in order to ensure that any transition would be smooth.

Workforce

(Continued from page 1)

employees are afforded every opportunity to maintain their Sandia employment if their skills fit a posted position. The realignment process includes a review of contractor-held positions into which a regular Sandia employee might be moved.

"Involuntary separations would be the final step in an extensive process to match regular Sandia employees to work," said John Stichman in the Dec. 11 bulletin. "Sandia management will take every step to minimize the impact to individuals."

The Labs will maintain a hiring program for direct work that could average approximately 400 or more per year.

The realignment process for nonrepresented employees follows a process spelled out in Sandia's workforce realignment policy. For represented employees, layoff processes are negotiated under Sandia's labor agreements.

Part of long-term planning

Sandia established its overall Labs-wide FTE targets in August as part of an annual planning process that is based on multiyear projections of business activities, revenue, and other factors.

"The separations we are seeing are the result of internal management decisions to streamline operations and reduce indirect costs," says BJ.

The specific positions being eliminated this year were identified as part of a Human Resources data call in October that asked each division to identify positions that were no longer consistent with the Labs' strategic needs or spending intentions.

"Our intent is to attain the long-range staffing targets established by the Executive Office last August," says John Stichman. "According to these plans, the total Labs regular FTEs will decline from approximately 8,400 today to approximately 7,800 by FY2011. To reach these numbers while minimizing potential layoffs, it is likely that indirect hiring will be limited to strategic positions and replacement of attrition where appropriate.

"Meanwhile, the Labs will maintain a hiring program for direct work that could average approximately 400 or more per year to meet our customer's needs in FY08 and beyond. The hiring plan reflects the Labs' strategic plan to control indirect costs and to deliver more direct work to the customer."

— John German

Library update

(Continued from page 1)

consisting of people "who have demonstrated strong interest in the fate of the library," she says.

An unusually large number of impassioned comments had criticized the library's modernization process on a blog started by ST&E senior manager Wendy Cieslak (1010).

One writer wrote of fears of a plan to close down most of the library building, "reduce the book and journal collection 'footprint,' and house the entire book and journal collection [in a single room]."

Says Julia, "Our goal is to create a forum where suppliers and consumers can get together, understand each other's constraints and needs, and explore how to create a library that will serve Sandia well into the future while maintaining sufficient ongoing library support to enable mission work to continue."

The board, says David, is expected to advise library management on matters ranging from journal subscription priorities to care of the book collection.

Agrees Julia, "The assumption that everything you need is available electronically is not true."

Reasons for transformation

But David reemphasizes that a transformation process is necessary.

Rapidly increasing costs for journals, books, and labor were making it impossible to maintain the library in its existing mode at reasonable budgets, he says. Continuing with "business as usual" would have resulted in reduced research holdings and an inability to modernize with improved services.

Furthermore, the inability of the current system to automatically adjust for Sandians who have moved to a different org. changed the focus of their research, and now require different journals and books, "is a problem in a limited financial environment," says David.

The solution, he feels, lies in newer technology. "Our library is currently under-technologized," he says. "It doesn't have the ability to collect, distribute, catalog, or steward through use of technical means."

A first phase of the library of the future that will be evident to users is a suite of services called "My Virtual InfoManager."

"My Virtual InfoManager will allow users to access

"We will not return to the old way of doing things."

— David Williams

information through online and interlibrary services through a 'smart' environment that facilitates greater access to resources, greater control over information seeking, and a wider range of information management activities," says David.

These services are expected to come on line later this fiscal year. Core elements of the software infrastructure that will enable these changes have been procured.

The idea, David says, is to reduce labor-intensive processes for librarians from days down to minutes or even real-time searches. With new equipment and programs, searches of a depth formerly impossible could be done by keyword from a researcher's desktop computer.

New library electronic services able to collect and analyze information from a variety of sources should lead to selections of book and online journal subscriptions better matched to the real needs of Sandia researchers.

The method should be an improvement over relying on past history of a user's selections, or polls that may only represent the views of the relatively small number who chose to respond, says Anna Nusbaum (9535), Technical Library Services manager.

The increased efficiency should also keep down costs.

In addition, Fred Heath, library dean of the University of Texas at Austin, and his staff have agreed to provide external input and advice to the library staff on successful modernization techniques. Wendy was instrumental in establishing the UT relationship.

Services temporarily restored

In response to earlier concerns, says David, the library is open "during the bridging period to new, transformed services" to all Sandians from 8 a.m. to 5 p.m. Evening visits are available upon request. Books are available for checkout. Reports and SAND publications are available, as are document delivery services. Other temporarily suspended services have been resumed.

"There are so many wonderful things that happen at a library," says David. "When I walk into a certain place [like that], I adopt a persona that opens me, that leaves me open to learning."

But modernization of some kind is a must, says David. "We will not return to the old way of doing things," he says.

Sandia's Library Board

Chair: Julia Phillips (1100). Members: Sam Myers (1100), John Taylor (300), Doug Osborn (6700), Tim Bartel (6000), Harry Hjalmarson (1400), Don Guy (9500), Neal Fornaciari (8900), Rae Robertson (4000), Brad Smith (245), Judy Neff (5924). Resources: Wendy Cieslak (1000), Nora Stoecker (12100), Alan Burns (1000)

One million trillion computations per second envisioned by Sandia and Oak Ridge researchers

'Exascale' computing targeted by new Institute for Advanced Architectures

By Neal Singer

Ten years ago, people worldwide were astounded at the emergence of a teraflop supercomputer — that would be Sandia's ASCI Red — able in one second to perform a trillion mathematical operations.

More recently, bloggers seem stunned that a machine capable of petaflop computing — a thousand times faster than a teraflop — could soon break the next barrier of a thousand trillion mathematical operations a second.

Now, almost without taking a breath, and before the world has actually achieved a petaflop supercomputer, a joint Institute for Advanced Architectures newly launched at Sandia and Oak Ridge national laboratories is charged with laying the groundwork for an exascale computer.

A thousand times faster than a petaflop, it would perform a million trillion arithmetic calculations per second.

A million trillion

What is the need for a machine to do that many calculations that fast?

Says Sandia Center 1400 Director James Peery, "An exascale computer is essential to perform more accurate simulations that, in turn, support solutions for emerging science and engineering challenges in national defense, energy assurance, advanced materials, climate, and medicine."

Such machines would be better detectives of real-world conditions, able to help researchers more closely examine the interactions of larger numbers of particles over time periods divided into smaller segments.

Supported by NNSA and DOE's Office of Science, the institute — a DOE Center of Excellence — is funded in FY08 by congressional mandate at \$7.4 million.

The idea behind the institute — itself under consideration for a year and a half prior to its opening — is "to close critical gaps between theoretical peak performance and actual performance on current supercomputers," says Sandia project lead Sudip Dosanjh (1420).

"We believe this can be done by developing novel and innovative computer architectures."

One aim, he says, is to reduce or eliminate the growing mismatch between data movement and processing speeds.

Processing speed refers to the rapidity with which a processor can manipulate data to solve its part of a larger problem. Data movement refers to the act of getting data from a computer's memory to its processing chip and then back again. The larger the machine, the farther away from a processor the data may be stored and the slower the movement of data.

"In an exascale computer, data might be tens of thousands of processors away from the processor that wants it," says Sandia computer architect Doug Doerfler (1422). "But until that processor gets its data, it has nothing useful to do. One key to scalability is to make sure all processors have something to work on at all times."

Splitting processors, increasing speed

Compounding the problem is new technology that has enabled designers to split a processor into first two, then four, and now eight cores on a single die. Some special-purpose processors have 24 or more cores on a die. Sudip suggests there might eventually be hundreds operating in parallel on a single chip.

"In order to continue to make progress in running scientific applications at these [very large] scales," says Jeff Nichols, who heads the Oak Ridge branch of the institute, "we need to address our ability to maintain the balance between the hardware and the software. There are huge software and programming challenges and our goal is to do the critical R&D to close some of the gaps."

Operating in parallel means that each core can work

its part of the puzzle simultaneously with other cores on a chip, greatly increasing the speed at which a processor operates on data. The method does not require faster clock speeds, measured in faster gigahertz, which would generate unmanageable amounts of heat to dissipate as well as current leakage.

(As a side note, the new method bolsters the continued relevance of Moore's Law, the 1965 observation of Intel cofounder Gordon Moore that the number of transistors placed on a single computer chip will double approximately every two years.)

Power considerations

Another problem for the institute is to reduce the amount of power needed to run a future exascale computer.

"The electrical power needed with today's technologies would be many tens of megawatts — a significant fraction of a power plant. A megawatt can cost as much as a million dollars a year," says Sudip. "We want to bring that down."

Sandia and Oak Ridge will work together on these and other problems, he says. "Although all of our efforts will be collaborative, in some areas Sandia will take the lead and Oak Ridge may lead in others, depending on who has the most expertise in a given discipline." In addition, a key component of the institute will be the involvement of industry and universities.

A spontaneous demonstration of wide interest in faster computing was evidenced in the response to an invitation-only workshop, "Memory Opportunities for High-Performing Computing," sponsored in January by the institute.

Workshop organizers James Ang, Richard Murphy, and Arun Rodrigues (all 1422) planned for 25 participants but nearly 50 attended. Attendees represented the national labs, DOE, the National Science Foundation, the National Security Agency, the Defense Advanced Research Projects Agency, and leading manufacturers of processors and supercomputing systems. Robert Meisner (NNSA) and Fred Johnson (Office of Science) served on the program committee.

UNM's FSAE team races to build competitive formula car by June

By Iris Aboytes

"It will only seat one, but it will hopefully go from zero to 60 in less than four seconds and give you the ride of a lifetime," says Sandia intern Zac Pickett (2991).

Zac is a member of the University of New Mexico's Mechanical Engineering FSAE (Formula Society of Automotive Engineers) class that is building a championship-worthy formula racing car to compete in the annual SAE West competition held June 25-28 at the California Speedway in Fontana, Calif.

The Formula SAE competition challenges students to conceive, design, fabricate, and compete with small formula-style racing cars. Restrictions on the car frame and engine are designed to engage the knowledge, creativity, and imagination of the students. Approximately 120 vehicles from colleges and universities throughout the world will compete this June.

UNM's program is a three-semester, seven-credit-hour

class that allows for the design, building, and testing

phases of the car. The team, now in the building phase, is responsible for all the dynamics. Zac and Phillip Pinsonneault (2991) are the project managers. Their greatest concern is funding. "If there is anyone out there who has won the lottery and would like to find an investment," says Zac with a big smile, "we would like to talk to them."

The project enables the class to work as a team to solve real problems. Students gain practical experience.

"Fabricating a car from the ground up is like putting

together a 3-D puzzle," says Phil. "Just when the team thinks it has considered every detail, something will arise, and the puzzle pieces need to be altered to work better."

The car was designed in the first semester and redesigned in the second semester to encompass new ideas and make UNM more competitive.

The team is implementing a number of new ideas into the 2008 design. One of the most ambitious is to base the car on a carbon fiber monocoque frame. The advantage is that it's lighter and stronger than steel frame construction and is used not only for the chassis but for the body as well. Other ideas: A new

engine complete with a continuously variable transmission pulled from a snowmobile and a praying-mantis style mono-shock suspension in the front and rear.

"The challenging hands-on work, as we make our own parts, keeps team members energized and focused," says Phil. "We started by studying last year's design and focused our emphasis in areas we thought we could improve."

There are 11 students in the class that includes five Sandia interns. Each student is expected to work at least 20 hours a week until the car is ready for competition. "We have heard stories about cars not being completed until the night before the competition," says Zac. "We don't want that to happen."

"I stayed an extra semester for this program," says Phil. "I didn't think I would enjoy it as much as I do. I found my niche. I have been working about 60 hours a week during the break."

"As much as we want to win, we want the 2009 car to be better than ours," says Zac. "That will mean that we have done our job."

To see past UNM cars and how they did at competition, visit fsae.unm.edu. To learn more about the competition, visit students.sae.org/competitions/formulaseries.

The Lab News will keep readers informed about the 2008 FSAE competition by having an update midway through the project and a final story after the completion of the race.



A RENDERING of the UNM FSAE race car.

Isleta Pueblo leaders get briefed on Sandia's emergency operations



Tribal leaders and first responders from Isleta Pueblo receive a briefing from John Ledet (4136) on some of Sandia's latest rescue equipment. Sandia's Emergency Management team offers periodic briefings to officials and responders from all of the Labs' neighboring jurisdictions. The briefings and meetings held with Isleta Pueblo officials help to strengthen the relationship between Sandia and the neighboring pueblo and provide the basis for future emergency planning.

(Photo by Randy Montoya)

Mileposts

New Mexico photos by Michelle Fleming
California photos by Randy Wong



Ward Bower
45 6337



John Long
40 9312



Eddie Hoover
30 247



Larry Stephenson
45 1132



William Pregent
30 6452



Anita Denton
25 10513



Ann Marie Gutierrez
25 6031



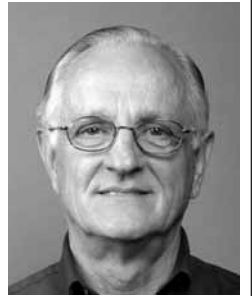
Mark Jenkins
25 1726



Don Joe
25 4122



Don Keener
41 2991



Allen Stanley
40 4242



Rochelle Lari
25 3512



Bruce Levin
25 6312



Timothy Moss
25 6337



Mark De Spain
20 2126



John Franklin
20 241



Bob Bradley
38 12334



Jose Gonzales
37 2734



Greg Haschke
20 5354



H. William Klein
20 9542



John Klem
2 1742



Patrick McDaniel
20 5441



Perry Robertson
20 1711



John Cummings
32 12140



Ashley McConnell
31 10312



Scott Rowland
20 4829



Karen Conley
15 5259



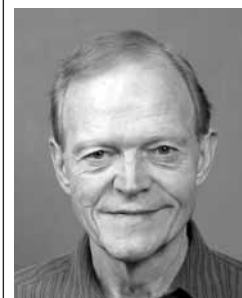
Karen Dunaway
15 5821



Elizabeth Holm
15 1814



Mabelle Karler
15 3512



Ron Grant
25 1737



Michael Hannah
25 301

Student Internship Programs Info Fair is Feb. 13

Have you considered hiring a student intern but unsure of what to do? Have you worked with or mentored a student intern but need to learn more about processes that affect the relationship? If so, the Student Internship Programs (SIP) staff in New Mexico invites you to attend the SIP Info Fair to learn more about developing and maintaining a winning and collaborative intern relationship. The fair provides an opportunity to share ideas and concerns and to discuss future needs of the Labs and future internship opportunities.

During the fair, there will be information about the student hiring and rehiring process, the effect of DOE requirements on obtaining and maintaining a security clearance, how to financially support a graduate intern's education, and how to pursue a student telecommuting agreement to continue a student's involvement while back at school. Information will be provided about all SIP services and the materials that are available to help you work with student interns.

The SIP Info Fair is Wednesday, Feb. 13, 9 a.m.-3 p.m. in Bldg. 811, Rms. 218-220.

For more information, contact Rick Alexander at rjalex@sandia.gov or 844-6823.



Margaret Miera
15 4136



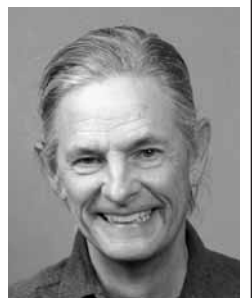
Nina Poppelsdorf
15 4121



Phillip Rivera
15 10267



Georgia Romero
25 10503



Steve Walcott
23 4122



Karla Simoes
15 6038



Ricky Tam
15 8521



Renee Urquidez
15 10503



Victor Chavez
20 5715



Lorraine Cordova
14 2027

One job, many 'careers' — a not unusual Sandia trajectory

Larry Stephenson reflects on nearly half century at Labs

By Darrick Hurst

As Larry Stephenson's (1132) 45 years of service at Sandia quickly draw to a close, he reflects on an extensive career that he describes as both a fortunate and rewarding one.

"I've really been lucky to work at Sandia," says Larry. "Working here has always given me the opportunity to pursue my interests and apply my abilities where they're best utilized. There's nothing more fulfilling than that."

Larry graduated from the Capitol Institute of Technology in Washington, D.C., in March 1962. He says it was Sandia's progressive research that captured his interest and compelled him to interview here later that same month. However, Larry says it was the New Mexico weather that he ultimately found irresistible.

"I interviewed at Sandia on a beautiful spring day," he says. "If it had been during one of the dust storms we occasionally get here, I might've opted for Bell Labs in Pennsylvania or General Dynamics in San Diego, but seriously, Sandia was my first and final choice."

Larry accepted a position in July 1962 and says that was the fruition of his intention of making a lifelong career at Sandia.

"For the first five years I worked with a radiation chemistry group at the Sandia Engineering Reactor Facility in Area 5," he says. "We used a cobalt-60 source to perform basic studies on the interaction of gamma radiation with organic materials. The group broke up when two of the principal researchers left, one to pursue a career at the space center at Cape Canaveral, Florida."

Larry then began working in applied materials projects related to weapons.

"I was working with Bob Cuthrell," says Larry. "Bob had been in the Air Force and had been persuaded to join the Air National Guard by a friend in our organization. About two months after he joined the Guard, Bob's unit was activated and he was sent to Korea for two years."

Following his work in applied materials, Larry began working in metallurgy and corrosion — particularly stress corrosion of titanium alloys — for the next 13 years.

"We studied metal fatigues like those seen in jet wings and bridges," says Larry, "something that is still



LARRY STEPHENSON (1132) looks into the vacuum system chamber of the Molecular Beam Epitaxy machine in his lab at CINT. The lab and MBE machine were recently filmed for a scene in the upcoming science fiction movie, "The Game." (Photo by Randy Montoya)

relevant research, as seen with the recent infrastructure failures."

"Sandia allowed me to continue attending school part time, and I earned a BS in chemistry from the University of New Mexico in 1975," he says. "In the early days, it wasn't like that — you couldn't change your career's direction. Directors could easily veto decisions for employees to pursue other interests."

"Shortly after obtaining my degree, I was offered a job on the Varian Molecular Beam Epitaxy (MBE) 360 machine," says Larry. "Ever since I had taken a course in instrumental analysis early in my college studies, I had been interested in research that combines electronics and chemistry."

"Tim Drummond (5917) and I were involved with the development of semiconductor devices including the precursors of vertical cavity surface-emitting lasers." In 1987, Larry began working with John Reno (1132) on molecular beam epitaxy growth.

"In 2006 we moved the MBE machine to Bldg. 518, the new CINT facility," says Larry. "That was quite an undertaking. It was nerve-racking watching our \$1 million machine being loaded on a truck with a forklift."

Among the most unusual experiences that Larry says he's had at Sandia occurred recently when his lab was transformed into a functioning movie set.

"Our lab was chosen for filming a short scene in the science fiction movie, 'The Game,'" he says. "It will be interesting to see how our MBE machine is portrayed in the film."

Larry says if there's one key piece of advice he could give to younger generations, it is "pursue your passion."

"The most important thing you can do in life is to like what you do and be interested in your work," he says. "Let your passion lead you. I've been lucky because I've been able to always move in a direction that my interests and abilities take me."

As for retirement, Larry has his sights set on a passion of another kind.

"I've got traveling in my future," he says. "Australia's beckoning to my wife and me, and I'm really looking forward to driving my restored '65 TR4 Triumph and beginning restoration on my wife's '65 Jaguar Mk II."

If Larry does happen to take a break from classic sports cars and globetrotting to reflect on his days at Sandia, he'll do so with no regrets.

"The work I've done here has been the most rewarding I've done," says Larry. "We're among the best in the world at what we do, I've never worked with anyone I didn't like, and I've always had the privilege of having the ability to choose my own path."

Labs leadership emphasizes safety with frequent ES&H walkthroughs

By Debi Angeli

Sandia is currently in the midst of a comprehensive inspection by DOE's Office of Health, Safety, and Security Office of Independent Oversight, HS-64. The important audit process, scheduled to run through Feb. 8, will look at all aspects of the Labs' ES&H implementation.

The HS-64 inspections are not unlike the inspections carried out by Labs senior management on a regular basis. Since April 2004 Sandia's top executives have conducted routine ES&H/Safeguards & Security (S&S) inspections, also known as safety and security walkthroughs, of Sandia facilities.

"The Laboratory is committed to respecting and honoring its people. Nothing shows that commitment more than ensuring that each of us has a safe place to work," says Labs President and Director Tom Hunter. "As in all things, we truly believe we must demonstrate our commitment by personal engagement. That's why we in Laboratory leadership use our involvement in surveillances to show that we care and that everyone's safety is important to us."

"For me," Tom adds, "it also provides an opportunity to meet with and listen to our staff — always a profound pleasure and a source of pride."

Tom personally leads the ES&H inspection effort; he's visited about 30 different facilities in the past two years.

"His interest and commitment to safety, security, and other significant issues that affect implementation of the Integrated Safety Management System (ISMS) throughout the Laboratory is evident when he does his walkthroughs," says Phil Newman, director of ES&H and Emergency Management. "Tom really wants Sandia to be a safe place to work."

And Tom is not alone. All executive VPs perform these routine inspections, taking ownership for safety outcomes and setting expectations for ES&H and S&S performance. Leadership wants workers to understand that through the implementation of best practices, safety performance can move beyond compliance to excellence, Phil says.

"Regular walkthroughs provide leadership new and innovative ways to address and communicate, integrating safety and security into day-to-day operations," says Craig Nimmo (12003), division security/ES&H coordinator for Sandia's Executive Office. "The self-assessment process is a way for leadership to drive safe integration of policies into performance."

While most walkthroughs are unannounced and chosen randomly, some are scheduled in advance. As in most cases, Tom's most recent inspection, of Bldg. 809 and its processes,

included observers from numerous levels and divisions within Sandia. Having a team along for the walkthroughs gives management from across the Labs insight into Tom's view on ES&H and security and what's important for success. It also gives these managers a chance to see how other organizations work, and share ideas and lessons learned. For this particular walkthrough Tom was joined by Center 1300 Director Jim Lee; John Gronager, senior manager (5910); Anita Renlund, manager (2555); Aaron Hillhouse, manager (2124); and Brian (BJ) Joseph (2112), ES&H coordinator for Bldgs. 809 and 2112. This visit included an extended explanation and evaluation of the building's work control and planning process, a high concentration area for leadership in 2008. As often happens, the assessment team came away with more noteworthy comments than observations and/or findings.

The management ES&H/S&S surveillances are a great success, says Craig.



LABS DIRECTOR Tom Hunter inspects a metal recycling bin at Bldg. 840. With him is Tommy Simpson (ret.) manager of Dept. 2341 at the time of the walkthrough.

"We really believe the intent of the management surveillances is to educate management about leadership expectations with regard to safety, security, and the environment," Craig says. "We want everyone to understand that safety is not in conflict with mission. Frankly, the reverse is true. Working safely is the only way to get our mission done."



JOAN WOODARD, Executive VP and Deputy Labs Director for Nuclear Weapons discusses safety at the Tonopah Test Range.

