Red Storm rising: Sandia/Cray team to create 40 teraOPS supercomputer

By Neal Singer

An announcement at Sandia — long awaited by the nation’s defense labs and computer industry — confirmed last week that Sandia has teamed with Cray Inc. to develop and deliver Red Storm, a massively parallel supercomputer theoretically capable of reaching a peak performance of 40 trillion calculations (teraOPS) per second.

The agreement was formally announced at a Sandia-hosted news conference Oct. 21 at the new International Programs Building east of the Eubank gate. Speaking were Sen. Pete Domenici, R-N.M.; Linton Brooks, acting administrator of the National Nuclear Security Administration; Bill Reed, acting director of NNSA’s Advanced Simulation and Computing Program; Jim Rottsolk, president and CEO of Cray Inc.; and Tom Hunter, Senior VP of defense programs at Sandia. Sandia President C. Paul Robinson made the opening remarks and introductions.

Said Tom, “It’s wonderful to see a vision become reality.”

Sandia reported in June that Cray had been selected for the award, subject to successful contract negotiations.

The machine’s speed is based partly on its 3-D mesh interconnect and Advanced Micro Devices’ (AMD) Opteron processors.

Custom aspects of the machine are a departure from recent trends in supercomputing architecture.

(Continued on page 4)
What’s What

Want to save a tree – maybe a small one? Or at least a couple of branches? If those paper pay stubs that show up every couple of weeks in your office mailbox – or the mailbox at home just pile up in a file folder or drawer, or just collect dust on a desk, maybe you don’t really need ‘em. And if you don’t need ‘em, there’s no reason to print ‘em. If that’s the situation, there’s an easy solution. Just go to the TechWeb homepage <http://www-irn.sandia.gov> and click on My Benefits (the button at the top of the page). Enter your username and Kerberos password and when you’re in, click on Direct Deposit, then Pay Statement Print Option, then check the box at Suppress Direct Deposit Advice Print and click on Save. If you ever need a printed version, go to the homepage and after clicking on My Benefits and logging on, click on Last Pay Statement and print it.

... We all know Sandia’s a fascinating place to work – the exotic research, pride of contributing to national security, interesting colleagues, and all that. But our locations provide us with some unusual moments unlikely to be found in most other research environments.

Last week, for example, a Sandian driving on Tonopah Test Range hit a wild horse; the same day, a rattlesnake was spotted and captured in Tech Area 4 at the New Mexico site; and the next day another rattlesnake was spotted and bagged at nearly the same place. The rattles were luckier than the horse; it was killed in the collision, but both (maybe the same one, just fond of TA4?) snakes were taken to a remote part of the lab site and released.

... You may not be aware of it, but this is an auspicious year, particularly if you have a Southern connection. It’s the 100th anniversary year of Moon Pies. Of course, you don’t have to be a Southerner to like them, but if you’re from the South, you’ve probably taken some ribbing about Moon Pies and RCs. And if you don’t know about RCs, that’s short for Royal Crown Cola, which is always paired with Moon Pies as the Southerner’s snack of choice. Now, if you aren’t from the South and haven’t ever had one, a Moon Pie is a blob of marshmallow creme sandwiched between round Graham crackers and the whole thing encased in chocolate. One of those and an RC cola and you suddenly appreciate Lewis Grizzard, John Lee Hooker, Hank Williams (Senior), country ham, grits, turnip greens, and sweet tea. And when you hear, “Hey, Grandpa! What’s for supper?” you know who Grandpa is and why supper’s all about.

If you want to know more about Moon Pies, look at this website: www.moonpie.com
And you’ll find more about RC Cola at this website: www.sandia.gov/LabNews

— Howard Kercheval (844-7842, MS 0165, hkerch@sandia.gov)

Sandia people

BJ Jones (3030) has been named director of Human Resources Center 3500, effective Nov. 1, VP Don Blanton announced last week. BJ served earlier as manager of the Benefits and Health Planning departments, HR Customer Service, and, most recently, the Workforce Management, Planning, and Staffing departments. More in a future Lab News.

Sandra Begay-Campbell (6219) has been appointed to the University of New Mexico’s Presidential Search Committee. She is a member of UNM’s Board of Regents and was one of three board members named to the 11-member search committee.

Take Note

Retiring and not seen in Lab News pictures:

Wendel Archer (1733), 34 years; Paul Elder (5733), 17 years; and Gloria Espinoza (6245), 25 years.

Congratulations

To DeAnna Wagner (9831) and Robert Spulak (2554), married in Las Vegas, Nev., Aug. 29.
To Donna and Craig (3128) Wood, a daugh-
ter, Amber Rose, Oct. 3.

Sympathy

To Susie Maldonado (9800) and Gil Maldon-
ado (DOE/1C) on the death of their son, Mark Maldonado, Sept. 19.
To Nancy Campanozzi (3113) on the death of her husband, Lou, Oct. 19.

National Atomic Museum now a Smithsonian affiliate

The National Atomic Museum has a presti-
gious new partner. An agreement with the Smith-
sonian Institution makes the museum an official “affiliate” of the Smithsonian.

“This is a win-win situation for our museum

Smithsonian Institution Affiliations Program

and the Smithsonian,” says National Atomic
Museum Director Jim Walther (12609) “We will be able to share collections, expertise, and exhibit knowledge with some of the most respected museums and curators of our country.”

The Smithsonian affiliation places the
National Atomic Museum in a league beyond the normal level,” says Jim. “The Smithsonian is known as a quality institution and we are pleased to be affiliated with it.

The National Atomic Museum, managed for
DOE by Sandia, is the first in Albuquerque to
become a Smithsonian affiliate. Inspired by a
1996 traveling exhibition celebrating the Smith-
sonian’s 150th anniversary, the affiliations pro-
gram is designed to bring the nation’s most
respected museum closer to the American people. The program allows member organizations to
borrow from the Smithsonian’s estimated 142-
million-piece collection. By loaning its collection, the Smithsonian shares its unseen collections and
helps other museums attract patrons.

“The program allows the American people to
experience the Smithsonian and its wonders in
their own backyard,” says Michael Carrigan, Smithsonian affiliate director.

There are now more than 115 partnerships, he says.

In addition to borrowing from the Smithsonian’s collection, affiliates can avail themselves of opportunities for curriculum development at school districts, workshops, study tours, and other programs. Smithsonian expertise in
care of collections and exhibition development is also available.

Recent Patents

Maarten de Boer (1762), James Redmond (9124), and Terry Michalske (1040): Micromech-
chine Friction Test Apparatus.

Barry Spletzer (15211), Diane Callow (15272), Lisa Marron (15211), and Jonathan Salton (6412): Method and Apparatus for Extracting Water from Air.

Anthony Bentley (2338), John Kelley (6219), and Fred Zutavern (15333): Use of Miniature Magnetic Sensors for Real-Time Control of the Induction Heating Process.

Marc Polosky (23614) and David Plummer (2330): Microscale Acceleration History Discriminators.

Douglas Adkins and Gregory Irye-Mason (14184), William Hofmeister (18543), Gerald Knorovsky (1833), Maarten de Boer (1762), James Redmond (9124), and John Smugeresky (8724): Direct Laser Additive Fabrication System with Image Feedback Control.

Ken Chen (9114), William Morgan (5774), and John Zich (14100): Process for Metallization of a Substrate by Curing a Catalyst Applied Thereto.
LDRD-funded materials breakthroughs hold promise for storing hydrogen energy

Performance of new material termed ‘astonishing’; research on it is expanding

By Nancy Garcia

In creating promising materials to store hydrogen, Sandia researchers have pushed theoretical limits, invented a better method of synthesis, and attracted attention from scientists, research partners, and automotive companies along the way.

This month, the research is expanding under two new Laboratory Directed Research and Development grants to further fundamental understanding of the promising materials and to demonstrate integration with a fuel cell. The newly funded work comes on the heels of a well-received invited plenary talk at an international meeting last month in Alsace, France.

Meanwhile, the new synthesis method is subject to a pending patent, and four industry leaders from automotive and oil companies have inquired about possible partnerships. Material made with the new low-cost, direct synthesis method has no hydrocarbon impurities that could damage a fuel cell and operates 10 to 20 times more quickly to charge or discharge hydrogen. Materials researcher Karl Gross (8723) has cycle-tested the new material, sodium alanate hydride, up to 160 times and terms its performance “astonishing.” With Eric Majzoub (8723), he is studying it as a model system for developing future hydrogen storage systems. “We have been working very hard on developing optimized versions of this material,” Karl says.

More than three years of work have been invested in studying the fundamental and engineering properties of these materials with the goal of developing a practical means to store hydrogen for hydrogen-powered cars.

“Given the progress we’ve had,” Karl says, “I think we’ll get there.”

Hydrogen’s advantages over fossil fuels include its lack of polluting emissions and the fact that it can be produced anywhere from renewable energy sources such as solar electricity or biomass. Proponents of an energy economy that emphasizes hydrogen point to the potential to improve urban air quality, decrease greenhouse gases released by burning fossil fuels that contribute to global warming, and gain independence from foreign oil.

Already, points out Karl, demonstration applications exist to generate power in a distributed system (off the electric “grid”) with hydrogen fuel, to run portable electronic devices on hydrogen, and to operate vehicles using hydrogen combustion engines and also hydrogen fuel cells. (Fuel cells convert chemical energy to electrical energy, creating water and heat without emitting hydrocarbon pollutants or “greenhouse gases.”)

Storing gaseous hydrogen does pose challenges, however. “It doesn’t matter what your power plant is,” comments Karl, “the biggest problem is storage.”

The FreedomCAR initiative announced by Energy Secretary Spencer Abraham in January seeks to promote the use of hydrogen as a primary fuel. It targets a vehicle system’s initial hydrogen storage at about 6 to 8 weight percent hydrogen. Given the tradeoffs between weight and volume, that goal accommodates roughly a 300-mile driving range per fill-up.

“No material provides that yet,” says Analytical Materials Science Dept. 8723 Manager Jim Wang. “Our research for the past few years has been on the leading edge of hydride development,” however, and has identified the class of material that appears to come the closest to that goal.

The material Karl and Eric are investigating was first shown in 1996 by German scientists to have achieved the breakthrough of being able to absorb and release hydrogen at reasonable pressures and temperatures when the material was doped with titanium. The ability of such hydrides to release hydrogen was known for half a century, but earlier versions of the material were not easily reversible.

Their material sodium alanate hydride has a theoretical reversible capacity of 3.6 weight percent hydrogen. This is more than double commercial room-temperature hydrides, which store about 2 weight percent hydrogen, and is equal or better than high-pressure or liquid hydrogen storage methods. Experimenting with material synthesis, they found that milling the elemental components together directly rather than relying on the common solvent synthesis process, was not only a more simple and less costly method, it also improved the purity and performance of the material. Steady improvements have been made in the materials, increasing the deliverable hydrogen from 2.8 to currently over 4.3 weight percent hydrogen.

“A whole new world of materials”

Each of these alanates outperformed about 15 other inexpensive hydrides that operate at close to room temperature. Karl hopes Eric’s work to understand fundamental properties of alanates will suggest new types of complex hydrides. “If it does work,” he says, “that opens up a whole new world of materials.”

Hydride storage of hydrogen fuel competes with pressurized storage (at 5,000 psi) and is an alternative to storage of liquid hydrogen, at 25 degrees above absolute zero, in a fiber-wrapped tank.

The new, more quickly charging material increases the appeal of hydrides, Karl points out. “Nobody wants to wait 20 or 30 minutes to fuel up, unless you put gas stations next to a Starbucks — so you can get your hydrocarbons one way or another,” he jokes.

A classic hydride may be thought of as a “spoon” in which the hydrogen is absorbed into the metal and fills spaces in the crystal lattice of the material. Karl and Eric note that when being charged with hydrogen, the alanates actually incorporate hydrogen in a two-step chemical reaction that forms lightweight hydrogen-metal complexes (that have covalent bonding character). The desorption process involves the chemical decomposition of the hydrides again in a two-step process. About two-thirds of the hydrogen is released in the first decomposition reaction and the remaining hydrogen is released in the second decomposition step. These thermal decomposition processes will deliver hydrogen at over an atmosphere of pressure above about 110 degrees C. This is near the temperature of a fuel cell’s waste heat, which can be used to warm the hydride bed to speed release of the remaining hydrogen.

A breakthrough invention? Perhaps

For that reason, “this is really an ideal application,” Karl says.

The Sandia hydride researchers kicked off an alanate working group meeting for DOE, which has funded the work to date at Sandia. The working group includes United Technologies, the University of Hawaii, Savannah River, and the Florida Solar Energy Center. Eric and Karl also work with the National Institute of Standards and Technology (NIST), the Colorado School of Mines, the University of Geneva, and the International Energy Agency on aspects of the hydride research.

Within DOE, Karl says, Sandia is “probably one of the leading labs for the FreedomCAR program.” Adds 8000 VP Mm John, “We may just have a breakthrough invention that could make hydrogen in automobiles a reality.”

Combustion Research Facility researchers have also been building on Sandia’s long-standing strengths in the study of metal-hydrogen interactions and engine studies to explore hydrogen use for electrical production by stationary power sources — turbines in particular.

Through an overall hydrogen working group, Joe Oefelein (8351) is modeling addition of hydrogen fuel to gas turbine combustors (which typically come online quickly to satisfy spikes in power demand beyond the steady supply of power available from steam turbines). Joe’s collaboration with the National Energy Technology Laboratory in this area has drawn interest from four industry leaders, said Jay Keller (8362).

Meanwhile, CRF researchers are also involved in the International Energy Agency’s efforts to create next-generation models for turbines that can burn hydrogen. The CRF is also seeking funding to demonstrate use of hydrogen fuel, with its near-zero emissions of NOx (smog-producing oxides of nitrogen), in an internal combustion engine, Jay added.

Although one of the biggest impacts of switching to hydrogen from fossil fuel will be seen in transportation, he said, its use in stationary power generation will also help to develop an infrastructure for its distribution and use.
Red Storm

(Continued from page 1)

annual projects, which have made a point of relying on off-the-shelf parts. Nevertheless, the machine is said to have an excellent price/performance ratio.

The computer, expected to be operational at Sandia in the third quarter of 2004, will be approximately seven times more powerful than ASCI Red, Sandia’s fastest computer now. It is also expected to have the capability to achieve 10 teraOPS with added hardware.

Nuclear weapon engineering simulations are the major driver of the computer, although it will also serve a broad spectrum of scientific and engineering applications.

For this reason, the installation at Sandia will operate in a dual-network configuration — classified (Red) and nonclassified (Black). The machine can be rapidly reconfigured to make all the compute nodes classified, all the compute nodes unclassified, or, in normal operations — three-quarters of the compute nodes classified and one-quarter of the machine available to the other.

Currently, the world’s fastest supercomputer is NEC’s Earth Simulator (35.86 teraflops) in Japan, followed by ASCI White (7.22) at Lawrence Livermore National Laboratory.

Spent Fuel

(Continued from page 1)

nuclear fuel,” Gary adds.

This seems obvious on the surface, but in the ultraconservative world of nuclear critical safety, an effect can be present even if it is accepted.

Thus, prior to the Nuclear Regulatory Commission ever agreeing to the more realistic view, it would have to be proven in actual experiments and compared to computer models showing the same effects.

In 1999 Gary obtained a three-year grant from the DOE Nuclear Energy Research Initiative to make benchmark measurements of the nuclear critical safety effects that fission products have on a nuclear reactor. The project was called the Burpum Credit Critical Experiment (BUCCX). Rhodium, an important fission product absorber, was chosen for the first measurements.

To do this the BUCCX team first designed and built a small reactor, technically called a critical assembly. In the 1960s-era Savannah Space Nuclear Thermal Propulsion (SNTP) Critical Experiment project, designed to simulate the behavior of a nuclear rocket reactor.

It took about 18 months to build the reactor and get authorization to use it. Only in the last few months have we begun actual experiments,” Gary says. “Much of the time was involved in proving that we can put in Sandia and DOE and to make sure it meets all ES&H concerns.

“It takes a pretty big team to bring up a new reactor, even a small one, in this day and age,” he added. “The team included members from all of the Area 5 departments that do reactor work. We also got considerable support from purchasing, the shops, and several of the ES&H departments.”

The core of the BUCCX consists of a few hundred full of pellets of clean uranium that originally came from the nuclear powered ship NS Savannah. Thirty-six of the rods can be inserted into experiment materials between the fuel pellets. Prior to conducting experiments with the rhodium, the researchers loaded the reactor to critical with only the uranium fuel. This provided a baseline point of where uranium goes critical. Then they loaded it with a product that could be compared to later experiments.

Then, the BUCCX team added about 1,200 circular rhodium foils between the uranium pellets in the 56 fuel assemblies to measure the extent to which the rhodium reduced the reactivity of the uranium.

“We then compared the critical loading of the reactor with and without the rhodium foils to the critical loading without rhodium,” Gary says.

And, to not one’s surprise, it took significantly more fuel to reach critical with the rhodium-doped rods than without them.

Months before running the physical experiments on the reactor, Gary was modeling on Sandia’s sophisticated computers to determine where the uranium doped with rhodium would go critical.

“I was curious,” Gary says, “I did calculations ahead of time so I could lay out the experiment and get a peek at what the experiments would say. In the end, I was fairly impressed with how accurate the calculations were compared to the actual physical experiments.”

Of course, the computer codes weren’t perfect, and had a small bias when compared to other calculations. But in analyzing the actual experiments in the reactor, Gary found that bias into account.

Gary says that experiments absorb neutrons better than rhodium. However, he selected rhodium to run the experiments because it is one of the few byproducts of fission that has a single stable isotope, which means the experiment would not be contaminated by the effects of other isotopes. Also, no one else has done any experiments with rhodium in a critical assembly.

Subsequent experiments could address the dozen or so other fission products that are important to burnup credit.

Also, to his knowledge, no other lab in the US is doing actual burnup credit experiments. Oak Ridge National Laboratory is running codes to determine how much the reactivity of spent fuel is reduced by fission products, but not doing actual experiments.

At the end of the three-year funding period, Gary says the Sandia program has come a long way in proving that spent fuel is considerably less than that of fresh fuel.

“In essence Sandia is helping pave the way for the Nuclear Regulatory Commission to address the safe and cost-efficient transport and storage of nuclear waste,” Gary says.

Buccx team members

It takes a village to raise a reactor, and not a small one. The lead roles on the BUCCX team were Gary Harms (6432), Sharon Walker (6433), Paul Helmick (6423, John Ford (6431), and Don Berry (6432). The team included Matt Burger (6431), Sal Dominguez (6431), Jim Fisk (ret.), Francisco Gonzales (6432), Mike Andazola (6432), Gerald Naranjo (6424), Mike Tuneley (3128), Jim Duncan (3128), Dee Brock (3127), Sylvia Gomez (6432), Kevin Cooley (6432), David Samuel (2992), Kevin McBride (6432), Tom Vanderheek (6433), Bill Peters (10251), Dave Mills (10255), Rob Naegele (6433), Joe Padilla (14186), Tony Zamora (14186), Rick Anderson (6432), Manny Trujillo (3111), Warren Strong (6433), Laura Latoma (3111), Fernando Dominguez (3111), and Dave Vehar (6432). The management team included Paul Pickard (6424), Jeff Phyllis (nov. 12333), Jim Bryson (6431), Ted Schmid (6430), Jack Loye (6430), Ron Simonton (now 7004), and Ken Red (6432).

SANDIA LAB NEWS • November 1, 2002 • Page 4
The US Marine Corps places the second US military order for Sandia-developed decontamination formulation

The US Marines have ordered tens of thousands of gallons of a formulation developed at Sandia that decontaminates chemical and biological agents and is non-toxic, non-corrosive, and environmentally friendly. (For more, see http://www.sandia.gov/media/dwfoam.htm.) The Sandia formulation is proven effective against both biological and chemical agents, can be applied with current military hardware, causes no collateral damage (such as loss of equipment), and creates an effluent that can be washed down the drain.

EnviroFoam, the other Sandia licensee, received an order from the Army for several tens of thousands of gallons of its product, EasyDe-con®, on Sept. 25 (Lab News, Oct. 18), and another order from the Army two weeks later. The three recent, large orders may signal high-level decisions within the services to begin replacing the current decontaminants the US military keeps on hand in case US forces are attacked with chemical and biological weapons. The formulation of the product supplied by Modec and EnviroFoam were used to help clean up federal buildings in Washington, D.C., and TV network headquarters buildings in New York following the anthrax-letter mailings in October and November 2001. The formulation was developed and refined by a team including Maher Tadros (16000), Mark Tucker, Larry Bustard, Cecilia Williams, Rita Betty, Paul Baca, Caroline Souza (all 6245), and Joanne Paul (former Sandian). Ongoing efforts are being carried out by a team at Sandia (6233), Danny Engler, and Molly Wilson (both 6245).

Shooter ID kit

(Continued from page 1)

A 90 percent correct detection rate.

glass swabs that can be rubbed on the hands, an instant test for police departments that only received a few orders from police departments that only received a few orders.

New orders signal increased demand for police departments to use the kits for field trials. As word spread, demand grew, says MacAleese.

Each Instant Shooter ID Kit includes a round fiberglass swab that can be rubbed on the hands, an instant test for police departments that only received a few orders from police departments that only received a few orders.

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Borrowing a theme from a national car-ad campaign from a few years ago — Sandia’s science and technology (S&T) program today is “not your father’s” S&T. While the Labs continues traditionally strong S&T programs in computing, engineering sciences, pulsed power, microelectronics, and other disciplines, Sandia also moved quickly in the past few years to ramp up major biotechnology and nanotechnology programs.

Science and Technology SMU leader Al Romig notes that all of these programs — new and old — support the work of Sandia’s strategic business units. “The S&T organization has two main functions,” he says. “One is to apply this underpinning of capability for the SBUs, and the other is to make sure we are investing our S&T funds so we have the right science and technology for the SBUs in the future.” (See “Sandia’s strategic business and management units” below for basic explanation of their responsibilities.)

SBU/SMU structure has helped

Sandia adopted the SBUS/SMU organizational structure about four years ago in part to improve coordination, cooperation, and communication among Labs technical programs, and Al says it has helped do all of these things. “We have more synergy and interaction across the laboratory and are capitalizing on that integrated strength in ways we never have before,” he says. “That’s one of the reasons Sandia has been so successful the last couple of years.”

Although S&T R&D work is done in the SMU’s centers, not only in Division 1000 but throughout the Labs, Al emphasizes that it is funded and managed by SBUs and the S&T SMU. There are 15 S&T centers scattered throughout the Labs’ technical divisions, and 10 S&T councils help coordinate activities in specific technology areas and encourage strong interdependent relationships between Labs-wide (see http://www-ir.m.sandia.gov/organization/smu/science/index.html). Keeping up with the progress and needs in these diverse and technically demanding areas is no small task, but Al relishes the challenge and obviously loves his work. “This job is an absolute hoot,” he says. “Sandia is a ‘candy store of science.’ Just being around this diversity of science and technology and the breadth of the collection of people you could ever imagine is very stimulating.”

Some new directions: bio, nano, cognito

Al talks eagerly about the accomplishments in traditional S&T areas throughout the Labs — computational science, modeling/simulation, materials science, microelectronics/microsystems, optical sciences, pulsed power, combustion, earth sciences, batteries and more — but he’s especially enthusiastic about Sandia’s plans and prospects in biotechnology, nanotechnology, and cognitive science.

“The Laboratory made a decision to invest in biotechnology approximately three years ago, and we’re enthusiastic about it,” he says. “First, we have a national security mission countering bio-threats — including bioterrorism, biowarfare, and emergent diseases. But it’s also clear that opportunity lies between biotechnology and nanotechnology. There will be materials and devices developed within nanotechnology, but their origin will actually be biological. We will use biological processes, or laboratory variants of biological processes, to create these new materials and devices.

“It’s clear to me,” continues Al, “that some of the materials and devices produced for engineering application 20 years from now will have at least a partial biological heritage. And there is an opportunity for Sandia’s traditional science skills in New Mexico and California — physics, chemistry, computation, and engineering — to contribute to solving the nation’s serious problems in biotechnology and medicine.”

(Note: More information about Sandia’s young biotechnology program is available on the web in a recently issued group of news releases; see www.sandia.gov/news-release/releases/2002/gen-science/bioinitiative.html. The releases are based on the Lab News series that ran this summer.)

Al is eager for the recently announced Center for Integrated Nanotechnologies (CINT, Los Alamos National Laboratory) to be fully up and running by this fall and into Sandia’s S&T program mix. Approved as a joint project involving Sandia and Los Alamos National Laboratory by DOE’s Office of Science this summer, CINT is one of five new Nanoscale Science Research Centers being created by the Office of Science. CINT construction costs are expected to total more than $75 million.

The Center will include a core facility in Albuquerque and a smaller building in Los Alamos.
Sandia’s exciting science, from the solid traditional areas to some surprising new fields, is helping forge the future

(Continued from preceding page)

Alamos, and the two labs will bring in cooperating researchers from industry and universities to work side by side with them. Sandia’s Terry Michalske (1040) and Don Parkin of LANL will serve as founding Director and Associate Director, respectively, for CINT.

Just getting CINT approved for Sandia and Los Alamos was a real accomplishment, Al says, because it was awarded in a crowded Office of Science competition.

The joint Sandia/Los Alamos proposal tapped into the two labs’ “incredible wealth” in the very best way, he says. “It’s exciting that we’re in a role in determining how nanotechnology will develop in the country and how it can contribute to our national security missions.”

Another S&T area that’s still pretty much in its infancy is cognition, or “cognitive science.” This is something that, he says, “could be the next frontier.”

“One issue for cognitive science is to understand how the brain thinks and processes so much information, and how we might emulate that in computational devices.

The brain/machine interface

“Another important part of cognition is to understand the brain/machine interface,” he says. We’ve already made minor progress in this area, he says — for example, understanding that a touch-screen is better than using a mouse for doing some tasks on a computer.

“Now we need to find ways to get thoughts directly transferred from the brain into computers and other machines,” Al says. “How cognitive science will develop over the next decade is totally unknown.”

Sandia has inched into the field, he says, starting last year with a Laboratory Directed Research and Development (LDRD) project that is exploring ways to enhance humans’ ability to process data (look for a future Lab News story).

Although he’s enthusiastic about cutting-edge technologies, Al also touts Sandia’s accomplishments and ongoing work in traditional S&T areas. “These new things excite me, but I’m also a practical person and excited that the science and technology we do here produces useful results today.”

As just one good example, he cites the work that Sandia Fellow Gordon Osbourn (1001) and colleagues did years ago on strained-layer superlattices. “This fundamental work gave rise to VCSELs [vertical-cavity surface emitting lasers], now making an impact in a variety of national security applications.

“The fact that we deliver real products that the country needs to solve real problems — based on our strong S&T capabilities — excites our people. Our science is done with a mission in mind.”

LDRD and MESA — paying off for national security

The Laboratory Directed Research and Development program, Sandia’s sole source of discretionary research funds, managed by Chuck Meyers (1010) and reporting to Al, is another big source of pride for the Labs, he says. The program funds long-term, high-risk research that has a high potential for future payoff in potential applications in the Labs’ four SBUs.

The Lab News has published several stories over the past year noting important developments for homeland security that resulted from LDRD projects. One is the chem-bio decontamination formulation that has been used to clean up anthrax contamination in late 2001 in several facilities, including federal buildings in Washington, D.C., and television network newsrooms in New York. It was recently selected for deployment by the U.S. Army Central Command (CENTCOM), which coordinates overseas military actions. CENTCOM ordered tens of thousands of gallons of the formulation from one of Sandia’s two commercial licensees (Lab News, Oct. 18).

Another important development growing out of the LDRD program, notes Al, is the MicroChemLab, which involved several S&T groups from Sandia’s California and New Mexico sites. Several varieties of the portable, hand-held chemical analysis systems incorporating “lab-on-a-chip” technologies have been developed. Sandia has established cooperative research and development agreements and licensing agreements with several companies to further develop the technology for national security needs ranging from the detection of chemical and biological agents to the cleanup and monitoring of environmental waste sites.

No coverage of “what’s hot in science and technology” at Sandia would be complete without referencing the huge MESA (Microsystems and Engineering Applications) Project, a state-of-the-art facility now in the early stages of construction. MESA will create a computationally intensive environment for the design, integration, prototype fabrication, and qualification of integrated microsystems into weapon components, subsystems, and systems for the US nuclear weapon stockpile, as well as systems for the other SBUs. MESA Program Office Director Don Cook (1900) reports to Al’s Division 1000.

“I describe MESA as computationally enabled microsystems,” says Al. Depending on the final construction schedule it is being funded in pieces, year by year, it’s almost a $500 million investment. If that doesn’t say the Labs is committed to a new way of doing business, then nothing does.” (See Oct. 18 Lab News, page 5, for recent MESA update.)
In Sandia talk, Stephen Covey emphasizes that people need to follow universal principles

By Chris Burroughs

Stephen R. Covey stood on the stage in the Steve Schiff Auditorium during an Oct. 21 presentation calling for someone 6′3″ or taller to come up and arm wrestle with him. 

People in the audience started shouting, “John, you go up.” John Michman, who is Sandia’s VP for Weapons Systems 2000 and fits both parties.

Covey went down, the winner would receive one dollar. After an initial tug, Covey’s arm went limp and soon both his arm and John’s flip-flopped back and forth several times.

“You see, I arrogantly insulted him,” Covey said. “He was on the lower road aiming for conflict. I was on the higher road and wanted him to win.” The result was we both won.”

Covey was trying to demonstrate that when people let go of their “emotional bank accounts” — what is he did when he let John win — they can work together better to find a solution that benefits both parties.

Covey, author of The Seven Habits of Highly Effective People and co-founder/vice-chairman of Franklin Covey, a global professional services firm, spoke at Sandia as part of a Leadership Series 2002 presented by Sandia’s Business and Leadership Development Dept. 3022, DOE, and Los Alamos National Laboratory. Future presentations, done through video by Dept. 3022, include “Living Leadership Worldwide” with former New York City mayor Rudy Giuliani and others on Nov. 13 and “Leading Change” with John Kotter of the Harvard Business School on Dec. 10. More information about the series can be obtained by contacting Phyllis Padilla Owens (3022) at 845-7110.

Covey also talked about the four different economic ages — hunter/gatherer, agrarian, industrial, and now the information/knowledge age. And although the country is supposedly in the knowledge age, the management of many organizations remains in an industrial age.

“How many of you feel a lot of pressure to produce more for less and how many believe that the vast majority of people in your organization possess far more creativity, resourcefulness, integrity, intelligence, and talent than their job requires or even allows?” he asked.

If the answer is “a lot,” he said, then you and your organization are still in the industrial age. And that is not good, he added.

“...The industrial age is focused on weaknesses, not strengths,” Covey said. “The knowledge age recognizes that the people who make valuable contributions and a strategy whereby employees and retirees pay according to their own experience. In the past, the way we figured non-Medicare premiums was to blend the claims experience of employees (approximately 7,500) and non-Medicare retirees (approximately 1,000) and come up with one premium for both groups. This artificially increased employees’ premiums and lowered non-Medicare retirees’ premiums. (Medicare retirees have been paying according to their own experiences for many years.) As was mentioned in the October Newsletter, Sandia paid $6,039 per employee on average in 2001 vs. $7,925 for non-Medicare retirees for health care overall, showing that non-Medicare retirees’ cost experience is higher. We felt that non-Medicare retirees experience should be pulled out because employees were not only seeing significant increases in their own premiums but were also subsidizing the higher cost non-Medicare group.

I understand your discouragement with the new healthcare premiums. Your frustration has been great, and we need to find a solution that meets the needs of both employees and retirees.

Two important points:

1. The future of healthcare premiums will be determined by the new healthcare legislation. We are working closely with the Department of Labor and the Department of Health and Human Services to ensure that the new legislation does not have a negative impact on our employees.

2. We have already made some changes to our healthcare plan, including increasing the deductible and copay amounts. We are committed to finding a healthcare plan that is fair and affordable for all employees and retirees.

Thank you for your patience and understanding as we work through this process. We will continue to keep you updated on the progress of our healthcare plan.

—Larry Clevegreen (3300)
Say goodbye to 9800B. After a rigorous historical study, numerous reviews to meet federal regulatory requirements, and detailed photo documentation, members of the Labs’ facilities organization will soon “decontaminate and decommission” this 40-year-old Coyote Canyon experimental facility.

In this case “decontaminate and decommission,” or D&D in the vernacular, means that anything of value will be degraded and the building will be demolished. “Its days are numbered,” says Nick Durand, project leader for assessment and decommissioning with Customer Projects Dept. 10825.

Rebecca Ullrich, team leader and corporate historian in Sandia’s Recorded Information Management Dept. 9612, expended considerable effort researching 9800B as a part of the D&D process. In reviewing the site — per the National Historic Preservation Act — she determined the facility is a historic property and needs full documentation principles. “The site is an unusual design for a firing pit. In most firing pits, it’s typical for instrumentation to be well set off. You don’t just park them in close to the explosives. But this site needed the instrumentation to be closer.”

**Contained by berms on three sides**

Bldg. 9800B is contained by berms on three sides lined with steel plating. Each of the berms covers an instrumentation bunker with a port-hole at the center of the firing pit. Unused for several decades, the berms helped pond scarce desert water and supported a number of small trees during its years of disuse. More recently, Nick and his colleagues have cut back brush at the site to aid in the needed surveying and photo documentation.

“We know it went up in 1964 and 1965 as a part of the ‘Halo’ test series,” Rebecca says. “It’s interesting to know that Sandia was working on lasers at that early point.”

The Halo experiments involved boosting laser power using explosives, she says. Reports and other documents indicate up to 50 pounds of explosives were used in some tests with ruby argon lasers.

A now-declassified report on work at 9800B provides no information about work on the project beyond 1966. “Our data objective is to have an unbroken sequence of information about the use of a site from construction to abandonment,” says Nick. “We’re lacking on this one.”

**A logical choice for risk reduction**

“We have a checklist and do an assessment. If there is potential for contamination, we do a characterization with samples and surveying. We look for drains, spills, spots, and materials like asbestos.” The site, although remote to Sandia facilities, abuts the Four Hills area. “It’s fairly close to a residential area, so it’s a logical choice for our risk reduction work. Without the building we’d be one step closer to returning the site to the Air Force or readying it for another Sandia use,” Nick says.

D&D is part of an overall strategy of managing space for Sandia with the goal of safely removing substandard, nonusable space that creates a financial drain on limited resources. The sites need to maintain active heating systems, fire protection systems, structural elements such as roofs, and necessary security, while the buildings remain standing. Their removal also frees up limited real estate.

**Open house features rough-and-ready gear as part of security force’s 52nd birthday**

In making decisions about which D&D projects to take on within the scope of the D&D budget (about $5 million this year), decision-makers also consider environmental restoration sites where cleanup has been completed or isn’t deemed needed by state regulators. The Labs’ Environmental Restoration (ER) Project deals with soils and surrounding environment, says Nick, but not structures, which belong to the facilities organization. However, if a structure is on a site where ER work is completed, it might be a candidate for D&D.

Nick’s group also makes use of EK’s investigations to try to fill out the historical picture. “It’s detective work on a budget,” he says. “One of the problems is that there are people who worked on these sites, but they haven’t thought about them in 30 years. Sometimes if you’re lucky, you can find one person.”

Decontamination isn’t always required, depending on the detective work, but clearance surveys for regulated chemicals and radiation are on the checklist. The proposed demolition must also undergo DOE review to ensure there is no other use for it by another agency. Finally, facilities staff work with the demolition contractors to determine what materials might be salvaged in keeping with good waste-minimization principles.

Although demolition is the most obvious part of the timeline, it only makes up about 20 percent of the activity, Nick notes. In the case of Bldg. 9800B, the obvious is fast approaching.

If you have information about past activities at 9800B, please contact Rebecca at 844-1483.
Mileposts

New Mexico

Rick Contreras from PMTS, Emerging Technologies Dept. 5908, to Manager, Defense Nuclear Material Stewardship Dept. 5326. Since joining Sandia, Rick has specialized in electro optics and the study of laser propagation phenomena, supported and designed field tests at White Sands Missile Range, and worked as chief of system engineering on the Multispectral Thermal Imaging (MTI) Satellite Project. Just before his recent promotion, he was a project leader for vulnerability assessments projects. The department he will now manage provides research and development, test, and evaluation of advanced technologies and modern material management systems to enhance safety, security, and accountancy of nuclear weapons, nuclear material, and weapon components during storage, handling, and transportation. Rick has a BS in electrical engineering from California State University at San Diego and an MS in electrical engineering from the University of Utah and a PhD in electrical engineering from Stanford University through Sandia’s Doctoral Study Program.

John McBrayer from PMTS, Design and Products Dept. 1730, to Manager, Frequency Devices Dept. 1732. He has more than 25 years experience in microelectronics, MEMS, and related fields. Since arriving at Sandia in 1977, John has worked on the design and fabrication of integrated circuits, contributing to the development of silicon solar cells, both design and fabrication. He has researched, designed and fabricated high-energy-density storage capacitors. John has been involved in the technical project and program leader for numerous Sandia projects, including high-energy-density storage capacitors, single-crystal silicon photovoltaics, 64K SRAM, 1.25 micron technology, and the research and development program with SEMATECH. He managed Sandia’s Agile MEMS Prototyping, Layout, Education, and Services (SAMPLES) program. John was selected as the first Distinguished National Laboratories Fellow and spent a year working on projects at the Air Force Research Laboratory’s Space and Flight Branch. More recently, he has been coordinating customer interface activities for the components supplied to DP programs from Microsystems, S&T, and Components Center 1700. John has a BS and an MS in electrical engineering from the University of Utah and a PhD in electrical engineering from Stanford University through Sandia’s Doctoral Study Program.

Jodi Maheras from PMLS, Office of the Deputy Director of Procurement, Dept. 10250, to Manager, Fleet Services Dept. 10265. Jodi joined Sandia in December 2001. She has 19 years (13 as a manager and or director) of experience in the areas of supply chain management, cost accounting, project management, automated business systems, budgeting and financial reporting, and fleet operations at the Idaho National Engineering and Environmental Laboratory. Jodi has a BBA with a major in finance and minor in accounting. She is a Certified Purchasing Manager, certified by the Institute for Supply Chain Management, and is a Certified Manager, certified by the National Management Association.

Brett Remund, from Manager, Synthetic Aperture Radar 1 Dept. 2348, to Level II Manager, RF Remote Sensing Dept. 2340. Brett came to Sandia in 1988 as an MTS from graduate school. His work has included synthetic aperture radar systems development, digital signal processing, image processing, and analysis, and embedded software development. Brett has a BS and an MS in electrical engineering, both from Brigham Young University.

California

Dennis Siebers, from DMTS, Engine Combustion and Hydrogen Dept. 8362, to Manager, Engine Combustion and Hydrogen Dept. 8362. Dennis joined Sandia in 1976 and worked in the thermal/fluid mechanics group in support of various weapons programs and the Solar Central Receiver Program. Since 1983, he has been working at the Combustion Research Facility in the engine combustion research program, focusing his research on using optical diagnostics to develop a fundamental understanding of the processes that control spray development, ignition, combustion, and emissions formation under the high-pressure conditions that occur in internal combustion engines. He has a BS and an MS in mechanical engineering from Purdue University, and a PhD in mechanical engineering from Stanford University through Sandia’s Doctoral Study Program.
COUCH/SLEEPER, full-size, green & white, relaxation pillow, new #200; carved chest, $175. 884-0321.
UPRIGHT PIANO, Walther, with/storage bench, excellent condition, $1,200.  Nemo, 884-9975.
MOVING boxes, barn tops, $5 per box, $25 per load.  884-2513.
MICROWAVE OVEN, glass & chrome, $25; 10 x 12 in., $10.  884-2210.
TALL-BROY SHOE ROCKER RECLINER, paid $700, paid $700, $400 OBO.  884-3802.
TABLE SAW, Rockwell 10-in. contractor, 3/4 hp, 4-1/2 in. depth of cut, $50.  884-2127.
BLACKSMITH FORGE, Champion, w/manuf. iron, $50; Kepco, excellent condition, $150.  884-3314.
SOFA & LOVESEAT, ivory, w/accent decor, $200; coffee table, $45.  884-2307.
LINGERIE RACK, 3 shelf, metal, $15; futon frame, $25.  884-2127.
CANDLERIA, 17-story, Coleman used, twice o/a, $200, 884-4056.
1989 KENWORTH, 8-ft. bed, 420 hp, $1,850.  884-1589.
PICTURES & FRAME, Steve Hanks, $60; student Pool Table, $125; Foosball table, $150; CAR AUDIO, 2, 12-in. Sony subs in DIGITAL CAMERA, Nikon Coolpix 5000, $100 OBO.  884-1592.
COFFEE TABLE, sofa table, 2 end tables, $50; KING-SIZE BED, mattress, box spring, $85; Baby Bjorn, $40.  884-2307.
LIFE JACKETS, used, different sizes, $10 ea.; RIMS/TIRES, 33 x 12.5 x 15, BFG AT, $125 OBO.  884-2513.
IRON, SW, Taylor Made driver, 3, & 5 irons, $70 ea.  884-2127.
IN COLOR TV, $35.  884-2127.
OBO; Mission hardwood dining set, LUMINARIAS, delivered Dec. 7 or 14, $1,000.  884-2127.
GENERATOR, for home emergency power, $500.  884-2127.
HARDWOOD FLOOR, & many tools, $1,850.  884-2127.
PICTURE frames, solid oak, $100; computer towers, $250.  884-3036.
ROLLOUT SHelves, solid oak, $100; computer table, $80.  884-3036.
TRIANGLE PATTERN, $65; DINING ROOM TABLE, w/6 chairs, $350.  884-3036.
CANE, 17-in., Coleman, used twice, o/a, $250, 884-4056.
Nigel Hey’s literary eye turns to the Solar System

By Ken Frazier

All those fortunate enough to have worked with Nigel Hey during his years as Sandia’s main contact with science and technology journalists worldwide know he has an eclectic mind, deeply interested in science and philosophy and always reaching outward.

How fitting then that Nigel’s first book since he retired from being a full-time Sandia employee in October 2001 to write books (he’s still a part-time contractor to Center 12600) is about the “out there,” our solar system.


He’s back home now in Albuquerque (actually Los Ranchos in the North Valley), but for a busy week or so at publication time in the UK Nigel was in London signing books (at the Science Museum in Kensington, at Borders on Oxford Street), meeting with his London-based editor, participating in a science writers meeting at the Royal Institution, attending a planetary sciences session at the Royal Science writers meeting at the Royal Institution, doing interviews about his book for BBC regional radio, and giving a speech to the National Space Centre.

Now some of the same may happen soon with the book’s US publication. Several New Mexico booksellers, including Lodestar Planetarium at the New Mexico Museum of Natural History have scheduled signings and talks (see box below), and other events are possible as well.

Solar System covers the history of the exploration of the solar system, profiles each of the planets, and explains launch systems and spacecraft instrumentation. Nigel’s reader-friendly text is interspersed with 12 short essays written by space experts such as Arthur C. Clarke (“Humans and Machines, Space and Time”) and David Morrison (“Killer Asteroids”). One is even by a Sandian, Roger Lenard (6424), on nuclear space propulsion. The book has 120 color illustrations, including some striking original photo illustrations commissioned by his editor. Nigel says the whole thing was quite a collaborative effort.

“Because of its broad treatment of the subject, Solar System makes an excellent introduction to space studies,” Nigel says. “It is not a textbook, but I hope it finds its way into schools and colleges.”

Nigel fears that today’s modern urban populations have fallen into what Carl Sagan called “cosmic isolation,” unable due to light pollution to see the night skies in all their grandeur and missing that sense of wonder and awe that comes from a visual and visceral identification with the cosmos. He’s become a steadfast space advocate. “We will never be so civilized that we give up the adventure, the wonder, and the pure delight of our star-filled sky.”

And perhaps that’s why Nigel calls his book “a nonfiction adventure story.”

Planetary scientist Clark Chapman of the Southwest Research Institute in Boulder, Colo., calls Nigel’s Solar System “a delightful book and an easy read. Eschewing the usual organization of a text, the book reads more like a collection of often philosophical essays about exploration of the solar system.”

Nigel traces his work on Solar System back to 1989. That year, while at Sandia, he served a stint working as a public information specialist for the launch of the Galileo spacecraft at Cape Canaveral (Sandia provided Galileo’s radiation-hardened microchips). He’d already written an earlier book about planetary science, How We’ll Explore the Solar System, and he began incrementally updating it, all the while working in Sandia’s media relations group and later, as a Senior Administrator, heading National Outreach Programs in Public Relations and Communications Center 12600.

In the summer of 2000 Phillip Campbell, editor of Nature, introduced Nigel to editors at Weidenfeld & Nicolson, and the book was soon on its way.

The London connection comes naturally for Nigel. He was born in England, and two of his three children, a son-in-law, and grandson live in England now. Nigel had journalistic stints in Britain, the US, and Bermuda before coming to Sandia in 1967. Except for a period away from 1972 to 1982 working for a London-based pharmaceutical market research company, he was back home again, out to the Solar System.

For further information, see Nigel’s website for Solar System at www.thesolarsystem.org. It provides reference material used for the book and many hyperlinks to other information and images.

Feedback

Q: When new web applications are being developed, are secretaries included on the teams or are they being left out of the loop as usual? They are the most frequent users of many processes that have been changed recently; e.g., procurement and Benefits (particularly the vac/flex balance page). The end results suggest they didn’t have input. There is a Move team that has been in existence for about a year, is there a secretary on that team?

A: We always strive to have representation from our customers in determining the requirements and operation of the computer programs used to interact with the business systems. This is accomplished for the software Sandia develops. In the cases cited above (procurement and Benefits), it involves commercial off-the-shelf software (COTS). With COTS software, we do not have the opportunity to develop or design. We strive to meet business needs with best business practices as determined by the commercial suppliers that don’t necessarily meet all of our requirements but allow commercial practices to drive the customer interface. We also strive to incorporate customer feedback to the companies involved in the design and development of the software. Regarding the second question, is there a secretary on the Move team? At this time, no; the team is working behind-the-scene processes and not the interface with the customers. — Gary Canionnon (10305)