Clean coal leads the way to a hydrogen economy for US

By Will Keener

The path to the hydrogen economy leads through some familiar territory. Although there are many long-term options for providing hydrogen as a future fuel, coal is a leading contender in the near term.

That’s the view of Chris Shaddix (8367), principal investigator for clean coal combustion at Sandia’s Combustion Research Facility. While some day we may be able to produce hydrogen by breaking up water molecules in association with the high-temperature heat from nuclear power reactors, or through renewable energy technologies, right now the most cost-effective way to produce hydrogen is with coal, Chris says.

Chris and his colleagues are involved in a number of experiments to optimize the combustion of coal to produce the most energy and the least possible pollution. While traditional coal combustion produces many harmful emissions, modern plants can meet environmental regulations for burning coal cleanly, Chris says. This can be costly to utility companies, but the cost of competing fuels—particularly natural gas—has climbed to the point where burning clean coal is competitive.

Figure in the possible benefits of sequestration of carbon dioxide emissions from the stacks (see Lab News, Jan. 20 stories beginning on page 3) and coal looks very promising for generating both electricity and hydrogen to provide a bridge to that future technology. “Utilities are starting to invest in coal,” says Chris. (Continued on page 4)

Sandia pioneers hydrogen economy

Rich Diver invents new way to make hydrogen for fuel

Invention splits water into hydrogen and oxygen

By Chris Burroughs

Borrowing from two different research areas that he’s pursued over his career, Sandia researcher Rich Diver (6218) has invented a whole new way to make hydrogen to power automobiles and homes.

His invention, the Counter Rotating Ring Receiver Reactor Recuperator (CRS, for short), splits water into hydrogen and oxygen, using a simple, two-step thermochemical process.

The CRS is a stack of rings made of a reactive ferrite material, consisting of iron oxide mixed with a metal oxide, such as cobalt, magnesium, or nickel oxide. Every other ring rotates in opposite directions. Concentrated solar heat is reflected through a small hole onto one side of the stack of rings. The side of the rings in the sunlit area is hot, while the other side is relatively cold. As the rotating rings pass each other in between these regions, the hot rings heat up the cooler rings, and the colder rings cool down the hot rings. This arrangement results in a conservation of heat entering the system, limiting the energy input required from the sunlight.

Steam runs by the rings on the cooler side causing a chemical reaction to take place, allowing the ferrite material to grab oxygen out of the water, leaving the hydrogen. The hydrogen is then pumped out and compressed for use.

A separate chemical reaction that drives off the oxygen occurs where the sunlight directly illuminates the ferrite material at the solar receiving end. This (Continued on page 5)

Intelligence community postdoctoral fellows conduct key research for Sandia

By Erin Gardner

Sandia has become home to five special postdoctoral fellows, who are part of a program sponsored by the intelligence community (IC) that aims to create informal partnerships between its scientists and engineers and those in centers of expertise in academia and national laboratories.

The Intelligence Community Postdoctoral Research Fellowship was founded by John Phillips, director of the Intelligence Technology Innovation Center (ITIC), in FY2000. “This program seeks to bolster scientific and technical resources of the intelligence community through working with future academic and national laboratory researchers by funding postdoctoral fellows to do research in all areas of science and technology,” says Phillips.

The IC Postdoctoral Fellowship Program has grown from just six fellows nationwide in 2000 to 58 in 2005. The program continues to grow, with a goal of reaching 100 fellows nationwide by 2008, according to Tom Kennedy, the program’s manager at ITIC.

IC Postdoctoral Fellows serve at universities, national labs, and other research institutions. They must be U.S. citizens; must be associated with an accredited U.S. university, college, or selected national laboratory; and must have completed their PhD by the time of award. The program provides an opportunity for postdoctoral fellows to work for two years with an option for a third, according to Marty Carr (5932), who was involved with the program while on assignment to ITIC recently.

During their term, IC Fellows conduct undiscovered research level science and submit technical papers to peer-reviewed professional journals as well as to the journal of Intelligence Community Research and Development (IICRD), as described on (Continued on page 5)

MESA’s MicroLab ribbon-cutting set for April; move-in is June

Managed by Lockheed Martin for the National Nuclear Security Administration

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BEAUTIFUL VIEWS — MicroLab, one of the main buildings of Sandia’s new Microsystems and Engineering Sciences Applications complex, is scheduled to have a formal ribbon-cutting ceremony in April. The building, which has inspiring views of the Manzano Mountains, will house 275 engineers, scientists, and technicians from a variety of Sandia organizations. See Next Singer’s story on page 6. (Photo by Bill Doty)
What’s what

As usual, this issue of the Lab News is chock-full of interesting stuff about our lab community. But to peek ahead a bit, be sure to check the next issue, Feb. 17, and read John Taylor’s (303) fascinating invited piece on the history of engineering, in observance of National Engineering Week, Feb. 19–25. Alongside it, you’ll find an interview with Laboratory Director and Chief Engineer John Stichman’s brief companion piece on engineering at Sandia.

John Taylor, who is a nuclear engineer by training, has written three books about New Mexico – Bloody Valverde: A Civil War Rattle on the Rio Grande, February 21, 1862, The Battle of Glorieta Pass (co-written with Thomas Edrington), and Defend a Joe Ninios Venir a Mi (Suffer the Little Ones to Come Unto me): A History of the Parish of Our Lady of Guadalupe in Peralta. He’s as entertaining a writer as he is an accomplished engineer.

If you think of highways, mining, skyscrapers, bridges, gearboxes, electrical circuits, and stuff like that when you think of engineering, you’ll be enlightened with John’s vignettes about pyramid-builder Inahote, Roman aqueducts, medieval military engineering, and more.

Don’t miss it.

The query here in the Jan. 6 issue about old buildings brought a few responses.

From Gary Hie (10864): “The oldest building we still haven’t torn down is 849, which was erected in 1948. It’s the old steel-skinned lab northwest of 860. Three of the Motor Pool buildings are the same age. Then we have several existing buildings erected in 1949, which includes 800, 804, 808, 835, and 860. . . . So 868 is not our second-oldest building, it’s down around #10 at the best.”

And Nicholas “Money” Winovich (6955) offered a twist on the question, listing out: “You could . . . claim 828 is the oldest building at Sandia. It was when it was torn down in 1999, but the monument in front of 810 [the CNSAC Building] that looks like 828 actually is 828, or part of it at least. The two triangular frames on the crane rail beam they support are the actual ones that were part of 828, not copies that look like it. So part of 828 is still standing and that might make it the oldest building at Sandia.”

But the authority probably is corporate historian Rebecca Ullrich (4532), who keeps up with such stuff as part of her job, of course, and wrote that of buildings still standing, the dozen oldest appear to be: 804, 800, 808, 603, 846, and 851, all dating from 1949; and 868, 892, 874, 879, 894, and 3210 (Coronado Club), all dating from 1950. “The list is somewhat soft,” she added, “because Facilities tracks the date acquired by Sandia, which usually means when they were ready for occupancy. Facilities’ own database shows the dates as a year or to two later for most of these structures. But the story is that 804 opened first, followed quickly by 800.”

And like any good historian, Rebecca invites replies, noting that she’s “anxious to get correct information.”

—Howard Karchevel (844-7842, MS 0165, hckarch@san.org)

Recent Patents

Mark Baumann (6422), Charles Busseau (6418), David Hannum (6418), and Kevin Linker (6418): Portable Chemical Detection System with Integrated Preconcentrator.

Richard Pryor (1433) and Nipa Basu: Method of Predicting a Change in an Economy.

James Allen (1824), and Jeffrey Dohner (1712): Microelectromechanical Mirrors and Electrically Programmable Diffraction Grating Based on Two-Stage Actuators.

Ron Renzi (6245): Fluid Injection Microvalve.

Paul Dentler (8764): Photonsensitive Dissolution Inhibitors and Resists Based on Onium Salt Carboxylates.

Katherine Bogart (1126) and Arthur Fischer (1125): Flip-chip Light Emitting Diode with Resonant Optical Microcavity.

Feedback

Q: Assuming that an individual has many years of dedicated service and excellent reviews, what is the Sandia policy regarding the “forced” or “strongly recommended” use of vacation time simply because the staff member is simply “out of work” (through no fault of his own due to project funding cutbacks, cancellations, etc.) even after exhausting every possibility, every contact, source of potential work, matrix options, lab posting, etc.? Is there a Sandia center support policy (or corporate P/T num-

ber) that could be applied in stressful situations like that until he can get back to being a productive member of the workforce?

A: In accordance with CPR 300.6.16, “Vaca-

tions are scheduled in accordance with employee preference, subject to the needs of the business. To the extent possible, vacations are scheduled to meet personal needs.” That said, just as an employee cannot require a manager to approve vacation, a manager should not require an employee to take vacation.

In instances where an employee is out of cur-

rent work, this is an issue for the employee and manager to proactively address. This situation should not come as a surprise to the employee or manager both should be aware of the fund-

ing status. If a shortfall is encountered, the man-

ager may be required to temporarily or perma-

nently redesignate personnel as needed. In projects where they may charge a center support project as directed by the organization. Due to the nature of the projects, funding is not available ad infinitum for this situation as each organization is responsi-

ble for managing its budgets accordingly.

I would encourage you to speak with your manager regarding other work that may be avail-

able within the center and/or division until work within your department is available. If you choose to use your vacation, that too will help with the organization’s budget position over the course of the year.

—BJ Jones (3500)

Women golfers, here’s your chance

The Sandia Women’s Golf Association (SWGA) will hold its Annual Membership Drive Wednesday, Feb. 15, at 5:30 p.m. at the Cesar Chavez Community Center, 7059 Kathryn St. SWGA is open to all active and retired Sandians and DOE people, their spouses and dependents, active military personnel, active civilian employees at Sandia, KAFB, and DOE. Contact Linda Daniels at 844-5724 or e-mail to lidian@san.org.

Take Note

Retiring and not seen in Lab News pictures: Susan Sinich (4535), 23 years; Larry Garcia (5950), 28 years; John Taylor (10864), 21 years; Chris Saavedra (108431), 30 years; Gary Scriver (5935), 28 years; Louis Matthews (4211), 21 years; Katherine Bogart (1126) and Arthur Fischer (1125): Flip-chip Light Emitting Diode with Resonant Optical Microcavity.
A simple solution helps design complex microfluidic devices

By Nancy Garcia

The µChemLab project began with a problem, how to detect trace explosives with a compact, field-portable device. The device relied upon miniaturizing a standard laboratory technique for separating mixtures of components as they move through a column under an electric field — chromatography. But the hair-thin chromatographic columns that could be packed onto a microfluidic chip, suffered from a "racetrack" effect at the turns, so that particles being separated on the outside of the curves had farther to travel, which smeared the sharp peaks needed for identification.

Unfortunately, the theory behind this transport problem was too complex to model on supercomputers, but Eric Cummings, a principal investigator during the 10-year development funded through Laboratory Directed Research and Development projects, saw that the velocity aspect could be represented by a simple equation with a few constraints, leading to a theory for ideal electrokinetic flow.

Mathematicians Stuart Griffiths (8700) and Andrew Skulan and Louise Barrett in Microfluidics Dept. 8324 under principal investigator Greg Fiechtner.

The model suggested that if the applied voltage were at an angle to the array, and to concentrate in regions over time. That unforeseen development led to the creation of a sorting and trapping technique known as insulating dielectrophoresis, or iDEP (because the posts are made of a material, such as silica or plastic, that is electrically insulating).

Trapping by tilting the array created non-uniform fields. So overall flow would not be affected, they conducted a quick analysis to find conditions needed to keep the fields uniform within the channel regions. The analysis indicated that varying the channel depths by interspersing deeper regions with more shallow "spillways" could not only provide uniform fields on each side of the junction, it also allowed designers to incorporate angles in the shallower regions to turn the flow without causing dispersion. This ability to turn the channels permitted creating networks by using calculations simple enough to perform on a calculator.

This breakthrough, several years after the research started, now offered a general solution to the initial dispersion problem.

Experimental investigations of microfluidic channels containing cross-channel ridges designed using Eric's spatially uniform field approach resulted in two publications in the fall of 2005 in Analytical Chemistry. One demonstrated the influence of manufacturing limitations on fluid flow in ideally designed channels and the other demonstrated continuous separations and concentration of bacterial cells. The work was conducted by postdoctoral researchers Andrew Skulan and Louise Barrett in Microfluidics Dept. 8324 under principal investigator Greg Fiechtner.

Eric's approach has also led to other devices. One sorts particles into parallel streams by their volume and conductivity and is referred to as a particle spectrometer.

The team has found it useful to design these microfluidic spectrometers with arrays of ridges patterned through photolithography. "Once you've paid for one ridge you can have more," Eric says. They call this latest approach a corduroy design methodology.

With it, they have concentrated materials by a factor of 6,000 in 16 seconds, although the upper limit is just a function of how much flow can be pushed through. They have also broadened the concept to concentrate, mix, purify, filter, or sort molecules through perturbing the flow in a variety of ways, besides using an obstacle such as a ridge or valley.

The advantages are that the separations can occur at dramatically higher rates than conventional methods, and they can be based on mechanical or electrical properties not previously exploited by other methods. The speed comes about because separations occur throughout the entire breadth of the microfluidic channel, since they rely on bulk behavior that occurs in a gradient, rather than surface phenomena requiring interaction with a boundary. Theoretically, a large protein might be separated in 10 milliseconds — five orders of magnitude quicker than through conventional chromatography.

A further advantage is that to handle a greater volume, the process could be carried out continuously and in parallel.

The team members believe they are heading toward near-instantaneous separations and manipulations of cells, proteins, and other molecules that can aid research in genetics, proteomics, or sorting and preparation of novel materials; development of medical diagnostic devices; and rapid detection of biological or chemical incidents, among anticipated applications. About such applications Andrew notes, "You can really let your imagination run wild. It's a very simple design, but there is a wealth of different behaviors we can obtain by varying the conditions we apply."

The researchers were thrilled to take advantage of the anomalous behavior they observed by employing their broad range of expertise to create better devices to support national security and related missions. "I'm like a kid in a candy store," Andrew says.
Clean coal
(Continued from page 1)

Two approaches

Two different approaches to burning coal are now under study. One combines coal with pure oxygen. The second, called gasification, burns coal only partially to create a gas. The first approach, called oxy-combustion, is driven by concern over emissions of CO₂ and other pollutants. The burning of coal in oxygen is a near-term solution that with current knowledge can produce exhaust streams that are close to pure CO₂, says Chris. Harmful pollutants like nitrogen oxides, sulfur compounds, and mercury are virtually eliminated. The second approach is favored by companies in Japan, Canada, Germany, and elsewhere where pilot plants are under construction. "Because the US didn't sign the Kyoto accord, companies here are not as interested," says Chris. "They tend to favor gasification technologies, which offer higher efficiency and low pollution formation."

One of these technologies, called steam reforming, combines the coal with steam in a hot environment to produce a "syngas," composed mostly of CO and hydrogen. Once the syngas is produced it can be burned directly in a combustor — such as a turbine — to produce power. Or the syngas can be further reacted with water to shift the remaining CO₂ to CO, and to produce more hydrogen. The CO₂ can be sequestered and the hydrogen can be used in lots of places: to power a car in an engine or to power a turbine to cool the flame temperature. One solution is to recycle cooler CO₂ into the burner to cool the flame temperature. The question is: what is the right proportion of oxygen and CO₂?”

Alejandro has been working on these experiments for about two years in the small-scale lab, but work is now underway to bring two other CRF reactors into the research. (Photo by Bud Pelletier)

Study takes systems look at gasification

SANDIANS Chris Shaddix and Andy Lutz (8367) are taking a systems approach to the concept of gasifying coal to produce both hydrogen and energy. This concept, favored by US industry, is also being addressed experimentally at Sandia’s Combustion Research Facility in Livermore.

The Laboratory Directed Research and Development project began last year with the development of a model of the key components in the system, says Andy. The concept (see diagram) is expanded to a commercial application. Large-scale tests in this reactor are expected to begin in a few months.

The third reactor is a two-story flow reactor that will help the team study the optimal coal combustion with recycled CO₂. The unit includes a six-inch-diameter reactor tube running downward below a 75-kilowatt thermal heater. Specially designed hardware injects highly refined coal particles into the top of the reactor tube. As the reaction moves down the tube, equipment allows sampling and laser diagnostic testing.

A key effort will be to measure the concentrations of ammonia and hydrogen cyanide, precursors to nitric oxide formation, says Chris. The coal "char" phase of burning can eliminate nitric oxide, creating the possibility that in actual operations more NO is consumed than is produced, leading ultimately to a commercial application. Large-scale tests in this reactor are expected to begin in a few months.

200-year supply of coal

The Western US, Illinois, Appalachia, and Canada make North America a place rich in coal resources. Other American neighbors, especially Colombia and Venezuela, also hold significant reserves of coal. All this makes the coal from the US somewhat analogous to the oil reserves of the Middle East.

In 2000, the US produced about 25 percent of the 4,600 million tons of coal produced worldwide. At the Year 2000 level, total reserve estimates indicate the world has a 200-year supply. Within the US most coal is transported by rail, with transportation costs comprising up to one-third of the total cost of delivered coal. While there is no reason to expect major cost increases for coal — with proven reserves identified and mining production costs well understood — transportation costs (especially diesel costs for locomotives) remain a key variable in utility company fuel calculations.
Rich Diver
(Continued from page 1)

is needed to regenerate the rings so they can react with more water during the next cycle. “This is out-of-the-box thinking,” says Rich, principal investigator of the Internally Funded Laboratory Directed Research and Development (LDRD) project. “We are combining a mechanical engine with a local producing device — something not done before to produce hydrogen.”

And it’s something that probably only Rich could have conceived of because of his unique background. He has knowledge of splitting water using high-temperature solar techniques — the theme of his PhD dissertation at the University of Minnesota — and of concentrated solar gained from his 15 years working with Stirling engine solar collector systems at Sandia.

Stirling dishes — named after Robert Stirling who invented them in 1816 — generate electricity by focusing the sun’s rays onto a receiver, which transmits the heat energy to an engine. The engine is a sealed system filled with hydrogen, and as the gas heats and cools, its pressure rises and falls. The change in pressure drives the pistons inside the engine, producing mechanical power. The mechanism is powered in turn by a generator and makes electricity. The key to a Stirling engine’s high efficiency is heat recuperation, analogous to the BFS.

Instead of making electricity like the Stirling systems, Rich’s invention will produce hydrogen. Rich’s ideas of making a hybrid Stirling/ thermophotovoltaic engine (SHP) also fuels the cost to do that, so he is combining the two into one.

He and co-author John Hall (1769), a chemical engineer, have been testing materials at the University of New Mexico’s Advanced Materials Laboratory to determine which will be best for attracting oxygen in the cool stage and releasing it in the hot stage.

“This invention calls for a new type of material,” says Rich. “We have to come up with one that is able to move oxygen from the sun and which has the right oxidation reactions.”

Postdocs
(Continued from page 1)

the program’s website, www.icpostdoc.org.

The annual call for proposals for the 2006 IC Postdoctoral Fellowship opened for 45 days beginning today. It can be found on the website. 

There are about 30 topical areas in physical science, technology, and liberal arts represented in the call. All are classified.

Principal investigators (PIs) must be professors or staff members associated with an accredited US university, college, or selected national laboratory. They are responsible for the oversight of the research and serve as the technical mentor to the fellow. The PI and postdoc also work with an intelligence community adviser who helps them understand the importance of the outcome of their research to the IC mission. “Working with the intelligence community gives the postdocs a first-hand look at how science and technology are important to the national interest,” says Marty.

Two requirements placed upon IC Postdoctoral Fellows are that they publish their work in peer-reviewed journals and attend the annual colloquium, held this year April 17-19 in McLean, Va. At the colloquium, first-year fellows give a brief summary of their proposed research for their current year. Second-year fellows give 30-minute presentations of their research results.

All proposals submitted undergo a rigorous review. Successful proposals are chosen on the strength of their relevance to topics in the annual call and on the qualifications and curriculum vitae (resume, list of publications, strengths) of the PI. The PIs may have certain postdoctoral fellow in mind when they prepare the proposal, but if not, one year is allowed to fill the position.

David Wilson (6634), who was the first Sandra Rich Diver’s invention is a two-step thermochemical process. The CRS is a stack of rings made out of a reactive ferrite material. Every other ring is arranged in the opposite direction. Concentrated solar heat is reflected through a small hole onto one side of the stack of rings. Through the tests at the Advanced Materials Laboratory, Rich and Jim have shown that by suspending the ferrite material in zirconia, a refractory oxide that withstands high temperatures, there was a high yield of hydrogen “quickly and repeatedly,” even after forming the mixture into complex solid shapes. Without using the zirconia, the ferrite material doesn’t hold together well; it essentially forms a slag and stops reacting. The ferrite/zirconia structures are laid line by line using robocasting, a method developed and perfected by other team members that relies on robotics for computer-controlled deposition of materials through a syringe. The materials flow like toothpaste and are deposited in thin sequential layers onto a base to build up complex shapes. A near-future step will be to build a prototype of the CRS, Rich says. Rather than constructing large dish mirrors to collect the concentrated solar, as is his ultimate goal, the initial tests will be done in an indoor solar furnace (see front-page photo) using a heliosat at the DOE-owned, Sandia-operated National Solar Thermal Test Facility.

Rich says that if the CRS and Jim are attempting to solve is extremely difficult.

“The water molecule (in the steam) is a tough nut to crack,” Rich says. “There is no guaranteed success. But that’s the spirit of an LDRD. It allows you to take a chance. I am grateful for this opportunity. We are putting different things together in ways other people haven’t thought of before. It’s a long-term stuff but ultimately can result in a clean alternative to pulling oil out of the ground.”

TEAM MEMBERS: Rich Diver (6218), Jim Miller (1815), Roy Hogan (1516), Mark Allendorf (8324), Nate Siegel (6218), Tim Moss (6218), Barry Boughton (1516), John Stuecker (1815), and Lindsey Evans (1815).

Feedback
Reader has questions about radios

Q: After working at Sandia for a number of years, I learned a couple of months ago that simple AM/FM radios without tape drives are now not allowed. Is this true? If so, why the change after probably 50 years?

A: There have been inconsistent and confusing communications on this topic in the past and we welcome the opportunity to provide updated information.

As CPR 400.2.10 states, personally owned electronic devices are typically not allowed; however, simple calculators, hearing aids, vehicle remote entry key fobs, garage door openers, and receive only one-way pagers are not typically prohibited or controlled unless local (e.g., facility-specific) restrictions prevail. Past guidance included radios/laptop/CD players that do not record in this list of personal electronics that were not prohibited or controlled, unless by local restrictions.

However, with the advent of new capabilities and blending of multiple technologies in personal electronic devices today, the entire topic of the allowability of personal electronics is being reexamined. There are potential issues with some of the newer technologies contained in today’s consumer electronics that need to be carefully evaluated for use in our environment. A team consisting of subject matter experts from different disciplines has been formed to evaluate the situation and also to look at possible alternatives to personal radios and laptop/CD players (like Internet radio). Until the team’s work is completed and clarifications and/or new rules are published, AM/FM radios and simple CD and tape players need not be removed from the workplace unless local restrictions apply.

Look for new guidance in early spring.

— Ken W ashington (4600)
The MicroLab is one of the main buildings of Sandia's new Microsystems and Engineering Sciences Applications (MESA) complex, located at Sandia's new Microsystems and Engineering Sciences Integration Facility (CINT). CINT is funded by DOE's Office of Basic Energy Sciences.

In Mike's view, MESA is more than buildings and facilities. He sees it as a part of a broader strategy to develop and use the latest technologies to solve real-world problems. "We're trying to find ways to make the most of our facilities, and to use them in ways that will benefit society," he says. "And we're always looking for new ways to use them."
RADTRAN gives radiation material transportation people free method for analyzing risks, consequences

Ruth Weiner serves as project lead; 200 users worldwide

By Chris Burroughs

In 1986 Sandia launched RADTRAN software to the public, giving the radiation material transportation community a new, free method for assessing risks and consequences.

Today, the code, which is much more powerful and easy to use, has 200 users throughout the world, ranging from companies that transport small medical devices containing radioactive materials to those transporting spent radioactive fuel from nuclear power plants. DOE funds the project, making it free to users.

National and international standard

“This software is the national and international standard for transportation risk assessment and consequence analysis for radioactive materials,” says Ruth Weiner (6143), a one-time RADTRAN user and now project lead of the Sandia program. “It calculates potential doses of radiation to the public and transportation workers, both in normal transportation operations and as a result of an accident.”

RADTRAN was originally developed in-house in 1976. Between 1977 and 1986 it ran only on Sandia computers and was used only by Sandians.

The program was released to the public in 1986, free to organizations around the world that transport radioactive materials. It has gone through several upgrades, with RADTRAN 6.0 expected to launch this year. RADTRAN 5.0 came out in 2002 and was the first downloadable version of the software.

The code combines user-determined demographic, routing, transportation, packaging, materials, and radionuclide data with meteorological and health physics data to calculate expected radiological risks and consequences of transporting radioactive materials. Since its inception, it has been used in most radiological transportation environmental assessments and environmental impact statements.

Users submit an online application, and upon approval, have access to the software. They are e-mailed a user guide to assist them in the downloading process.

“RADTRAN allows users to track potential radiation releases, for example, as a truck carrying radioactive material travels along a highway,” Ruth says. “It calculates doses of radiation coming from a shipment to various populations. Those doses are usually very small.”

Data collection began in 1970

RADTRAN does not make statements that shipments are unsafe, Ruth says. It only does calculations.

“We don’t think we can tell members of the public that something is safe or not safe,” she says. “We give them the data and they can decide for themselves.”

If there is an accident, like a truck carrying radioactive materials rolling over, RADTRAN can calculate doses of consequence and risk. It looks at what can happen — the scenario; how likely it is to happen — probability; and what if it happens — the consequence.

“We’ve been looking at and collecting data since 1970,” Ruth says. “There’s never been an accident where there has been a release of radioactive material that caused ill health effects. However, there have been releases of radioactive materials.”

Recently, a University of Michigan graduate student benchmarked RADTRAN with actual nuclear materials. She checked radiation emissions from three, five, and 10 meters away from the material and found that RADTRAN was slightly conservative in its dose estimates. (The student was one of Ruth’s PhD candidates at the University of Michigan, where she is a part-time professor. The student was a summer intern at Sandia in 1998.)

“We don’t think we can tell members of the public that something is safe or not safe. We give them the data and they can decide for themselves.”

Ruth Weiner

Training the world in RADTRAN

Also, the United States has agreements with other countries to provide them with nuclear power plant fuel. Under the agreements, the countries must return the spent fuel, which is then transported cross-country to locations such as Idaho National Laboratory.

Since Sept. 11, 2001, RADTRAN has been used to determine the consequence of a deliberate radiological attack, something that has never happened.

Ruth and Doug Osborn (6143) give regular training sessions throughout the US on how to use RADTRAN. They even travel to foreign countries to demonstrate the software.

Besides the US, RADTRAN has users in Korea, Taiwan, Japan, India, Bangladesh, and soon South Africa.

Ruth says Sandia programmers initially developed the RADTRAN program. Upgrades have been provided by both Sandians and Sandia contractors. While RADTRAN is written in Fortran, a code that isn’t even taught any more, no plans are in the works to change it.

“If we switch code, we may introduce errors,” Ruth says. “This is one Sandia product that has stood the test of time.”

More information about RADTRAN can be found at https://radtran.sandia.gov.
Sandians use vacation to help Katrina victims

By Iris Aboytes

Have you started planning a summer vacation, perhaps a cruise where you can sail surrounded by beautiful blue-green water? Imagine no phone calls, peace and quiet, your own cabin, and no problems to solve. Sounds great.

Now here is an alternative. A team of Sandians is taking vacation and going to southern Mississippi to assist in rebuilding what Hurricane Katrina took down. The trip is planned for March 16-26.

“No particular skills are necessary,” says Jeff Porter (5719), team coordinator, “though some construction/home repair experience would be helpful. We will be staying at one of the Presbyterian Disaster Assistance (PDA)-sponsored volunteer villages, much like camping. The majority of the team will be working in the site. Others may choose to fly to destination cities if willing to pay for some or all of their flight.”

This is the third Sandia team trip. The others were made last October and November. In each trip, families were assisted in hard-hit areas, fallen trees were cleared, flood-damaged homes were cleaned, and home rebuilding began for people who cannot afford such work without help.

“There was the Los Alamos fire,” says Jeff. “I wanted to help but could not. Then there was 9/11 and I was blown away; there was something I couldn’t do. This time I can help, and help a lot of us will.”

The Sandia team has put together a small trailer full of tools that they tow. “Some tools are available on-site, but it is hit-and-miss,” says Jeff. “Team members leave nothing to chance. Upon arriving we get work orders from a community agency for needy families. The talents of the group are matched with the needs of the community. The Sandia team specialty is sheet rock and inside trim work. Volunteers can expect to work on reconstructing homes, mostly in the areas of roofing, drywall, flooring, and painting.”

VOLUNTEERS — Gail Kaplan, Jeff Porter (5719), Julie Bouchard (6225), Jeff Sproul, Dennis R. Johnson (2550), Pati Valles (4311), and Will Nall. (Trudi Martinez (5521) took the photo.)

Julie Bouchard (6225) has gone on the previous two trips and is planning on going in March. “There is so much to be done. It is almost overwhelming. After the first trip, it was easy coming home, because I knew I would be going back soon.” Julie’s husband Daryl accompanied her on the second trip and will be going again. “On the November trip, we worked on the homes of several elderly women. They were so grateful for the help. The water damage and resulting mold is too much for a person to handle on their own.”

“The environment on-site is not unlike building a Habitat for Humanity home,” says Jeff. “Most participants have reported that it is a significant, possibly life-changing experience.”

Jeff needs to know by Feb. 16 if you are interested in getting involved in this trip. He says he will accept latecomers.

For more information, go to the PDA’s website for Katrina relief at www.pcusa.org/katrina. For more details, you can contact Jeff at 844-9496 at work or 345-4034 at home.

NEW CDC 7600 COMPUTER — The new Sandia computer went on-line in Sandia’s Computer Center in February 1976. Pictured with the new computer are from left, Lee Hollingsworth, Ron Detty (now VP, Division 4000), and Kelly Montoya.

Our principal job is to so design these systems that the energy produced is less — or a least no more — expensive than that available from conventional sources,” Sandia’s new CDC 7600 computer and the enhanced capabilities it would eventually provide to the Labs was featured in a center spread in the Feb. 20 issue. Although the 7600 was slated to become part of Sandia’s scientific computer network, Sandia experts said it would take about 42 “man-months” to develop software necessary to integrate it.

NO layoffs — The Feb. 16, 1996, issue announced that Sandia’s Voluntary Separation Incentive Program (VSP) had helped the Labs accomplish a primary goal of its Workforce Realignment Program — to eliminate 327 “impacted” positions throughout the Labs without forced layoffs. A total of 271 positions were eliminated through the VSP, with the remaining 56 eliminated through internal transfers, normal attrition, and other resolutions.

— Larry Perine
Manager promotions

New Mexico


Don joined Sandia in 1992 as a project manager in Corporate Construction Program Office Dept. 10824, where he managed congressional lineitem construction projects, such as the Neutron Generator Facility and the Center for National Security and Arms Control.

In 1997, Don was assigned as a project manager in the International Safeguards, Security, and Systems Engineering Department (6925) where he managed international safeguards work in support of DOE and the International Atomic Energy Agency.

Don has a BS and an MS in industrial engineering from the University of Wisconsin and an MA in management from Webster University.

Mark Soon Hoo from DMTS, International Physical Protection Program Dept., 6952, to Manager of that same department.

Mark joined Sandia in 1976 and currently works in International Physical Protection Programs, which assists countries by improving the security of their nuclear and radioactive materials.

Mark works internationally on the physical protection of nuclear and radioactive materials, working closely with the International Atomic Energy Agency (IAEA). He previously worked in the areas of arms control and treaty verification, physical protection of domestic nuclear facilities, and mechanical metallurgy.

During his many years with Sandia, Mark has had several career highlights. In 1987, he worked on the Technical On Site Inspection (TOSI) project and spent six weeks located outside a Soviet missile assembly plant to install equipment to monitor for treaty compliance.

From 2000 through 2003, Mark took a leave of absence from Sandia to work at the IAEA in Vienna, Austria. Here, he worked in the IAEA’s Office of Nuclear Security.

Mark has also worked on two additional assignments outside of Albuquerque at DOE Headquarters in 1993 and 2004, as a Sandian providing technical advice on physical protection. He has traveled to nearly 50 countries in connection with his international work.

Mark has a BS from the University of Arizona, an MS from the University of Illinois, and an MBA from New Mexico Highlands University.

Sally Uebelacker from manager, Ethics and Business Conduct Office Dept. 12410, to Level II Manager, Safeguards and Security Dept. 4230.

Sally joined Sandia in August 2004 and worked in the Ethics and Business Conduct Office.

Sally has significant experience in management, safeguards and security, investigations, and law. Specifically she has more than 24 years experience managing law enforcement activities and is a certified Protection Professional through the American Society of Industrial Security as well as a New Mexico licensed attorney.

In her new position as Senior Manager for Dept. 4230, Sally will oversee information security, personnel security, and security training and awareness.

Sally has a BS in sociology from the University of Tulsa, an MS in public administration from the University of Northern Colorado, and a Juris Doctor from the University of New Mexico School of Law.

Feedback

Acronyms make reader I.L.L.

Q: Can we cut down on the acronyms used on our paycheck stubs? SIP, SPN, OASDI/EE — where do they even come from? After a serious study, I found that somehow SIP means 401K, but what is SPN? I also believe that OASDI/EE is Federal Social Security Tax.

W hy can't we just call it Social Security? I am a rather conscientious person when it comes to my paycheck and other money matters so I study the various deductions on my paycheck stub regularly. However, even after working at Sandia for some time, I still have to take a moment to decipher the paycheck stub each time I look at it?

Can these be reorganized to cut down on the acronyms and use more plain English?

A: Sandia’s Payroll Department utilizes standard industry nomenclature in describing “Social Security” withholding tax as the Old Age, Survivors, and Disability Insurance (OASDI) tax. The EE after OASDI is identifying that this withholding is being paid the employee and not Sandia Corporation, which must match this withholding amount as one of our employer taxes.

SP is an abbreviation for the Sandia Corporation Savings and Security Plan. You are eligible for SIP if you are not a union member and you meet other criteria; eligibility for the SSP requires union membership along with other specific criteria.

The “N” designator after either the SIP or SSP abbreviation means NO company match — that is, Sandia will not match at 66-2/3 percent the first 6 percent of your eligible earnings that you authorized to be withheld from your pay. You must be on roll for one year before becoming eligible to receive this benefit.

Your question will result in a review of all the acronyms and abbreviations used to describe the various withholdings and deductions on Sandia’s payroll remittance advice to evaluate their practicality and their utility.

I suggest you phone any one of our Payroll professionals or our Payroll Hotline at 844-2848 if you have any further questions regarding this matter.

— Don Devoti (10502)
Phil and Sylvia Fajardo give the gift of love

By Iris Abotes

Long-stemmed red roses and heart-shaped boxes of chocolates are traditional once-a-year symbols of love and Valentine's Day. At the Phil (2561) and Sylvia Fajardo household, they celebrate Valentine's Day every day sur-
rounded by living symbols of their four adopted children, Matthew, 20, Jonathan, 6, Micah, 3, and Micaya, who turns 2 on Feb. 14.

Sylvia's plan for life always included children, but as luck would have it she would have cancer twice by the time she was 15. Phil's plan also included chil-
dren. Meeting Sylvia at the Uni-
versity of New Mexico, he knew she had met his soul mate. Their

love for children shared, they agreed to adopt.

Four years after they were married they adopted Matthew, Sylvia stayed home to care for him and started a daycare for children up to preschool. Both Sylvia and Matthew were trained in CPR, "I never thought I would use it on one of my own children, but I did."

Jonathan moved into the Fajardo home when he was nine months old. His prospects were not good. He was born with myotic dysphoria, a form of muscular dystrophy. Chances were that he would not live to be 13 months. Once placed in their home Jonathan thrived and became stronger with therapy provided by Alta Mira, an early interven-
tion program.

Jonathan came up for adoption, and there was no doubt they would adopt him. They were told about a girl with severe necrotizing entercolitis (NEC), a life-threatening inflammation and infection of the intestines. She was very fragile, a life-threatening blood infection. She has short bowel syndrome as a result of the NEC. She was expected to die soon but needed a family to love her until she became an angel. Sylvia's heart said yes immediately, but she had to call Phil.

"Why are you asking me?" he answered.

"You know you are going to take her home." He knew that Sylvia had probably already agreed to take the baby.

"I was not planning to adopt any more chil-
dren," says Phil. "But God was telling me, 'Relax, go visit the baby.'" He went to the hospital to see
her and was told by the nurses that she was unres-
sponsive, lethargic, and very fragile. He scrubbed
for three minutes before he could enter the New-
born Intensive Care Unit to hold her. "When I
held her," says Phil, "she opened her big brown
eyes and touched my chin and beard with her
hand. That instant, she became daddy's girl." After
the Infant was taken meeting Micah, she started to
improve.

Micah did not become an angel; she became
her. She was expected to die soon but
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