

# Sandia, Intel dedicate world's fastest supercomputer

## Teraflops 9,072-processor supercomputer now fully up and running at Sandia

By Chris Miller

The full complement of 84 cabinets that compose the teraflops high-performance ultracomputer — the fastest computer in the world — is now operating at Sandia.

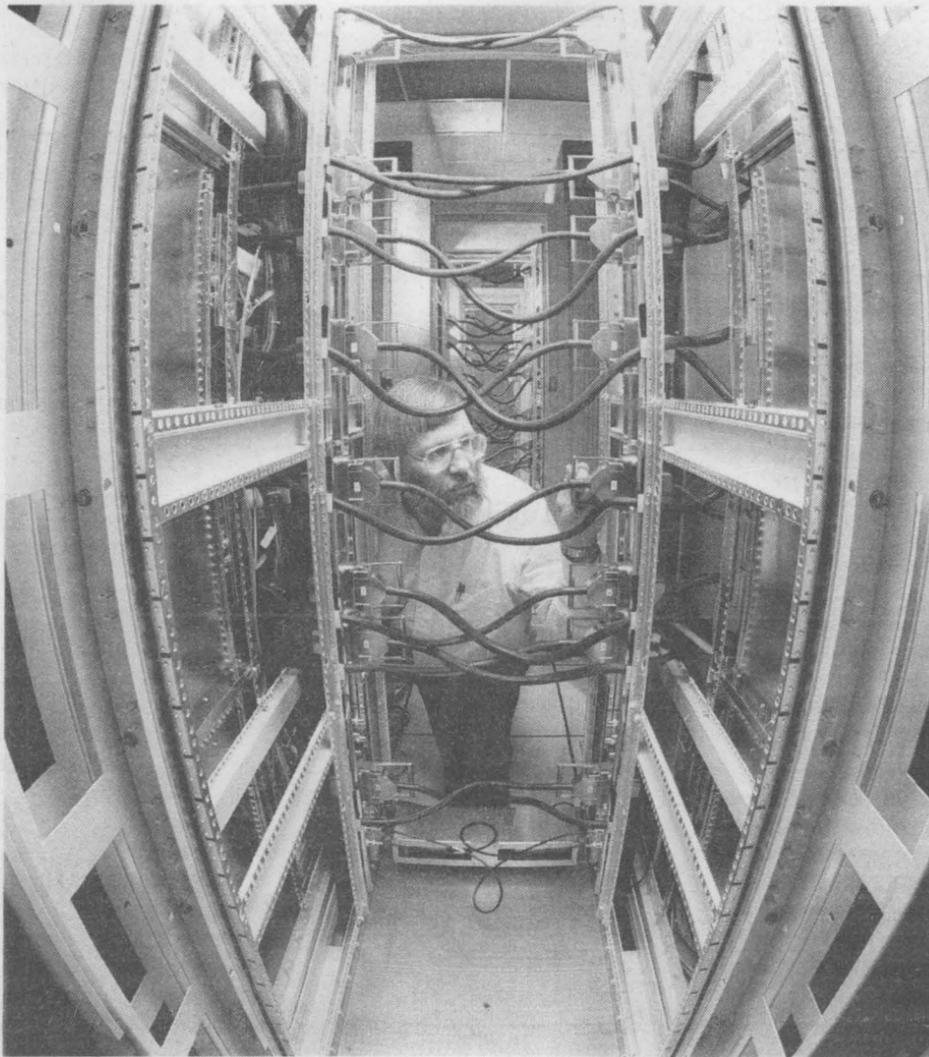
The Intel massively parallel computer was developed under direction of DOE for the Accelerated Strategic Computing Initiative (ASCI), a 10-year program designed to develop the higher-resolution, three-dimensional physics modeling needed to evaluate the aging nuclear stockpile without actual testing.

The teraflops (which stands for one trillion floating point operations per second), is made up of 76 actual computer cabinets with 9,072 Pentium Pro processors and has nearly 600 billion bytes of memory. The remaining eight cabinets are called disconnect cabinets and separate the machine so that classified and unclassified calculations can be run at the same time.

The entire computer consists of four rows with 21 cabinets in each row. It covers about 1,600 square feet in Bldg. 880, enough to fill a moderate-sized home.

The computer is capable of performing up to 1.8 teraflops, or floating point operations per second. It would take someone operating a hand-held calculator about 57,000 years to calculate a problem the teraflops computer could compute in one second.

This is the same computer that achieved the one-trillion math-operations per second computing milestone last December in a test demonstration at Intel's Beaverton, Ore., plant (*Lab News*, (Continued on page 4))



**SUPERCONNECTIONS** — Michael Hannah (4418) inspects cables in one of the eight disconnect cabinets that are part of the new Intel teraflops supercomputer in Bldg. 880. The disconnect cabinets are used to separate portions of the machine so that classified and unclassified operations can be run at the same time. (Photo by Randy Montoya)

## History-making supercomputer marked by ribbon-cutting, media event

By Ken Frazier

"This is a momentous occasion."

"It's the biggest day in the history of supercomputing."

The official inauguration of the teraflops supercomputer at Sandia June 11

was a celebration of an achievement that not long ago had been called impossible. Now it's seen not only as a strong contributor to national security but as a stepping stone to still more supercomputing power (hundreds of teraflops) in the near future.

The four stately rows of high-standing cabinets in an efficiently refrigerated computer room in the east side of Bldg. 880 have a scale that seems appropriate to their task but a visual ordinariness that belies their significance. With broadcast and print media in attendance and accompanied by the roar of powerful air conditioning equipment, officials representing the three main institutions behind the achievement — DOE, Sandia, and Intel Corporation — snipped a blue ribbon and talked about past and future.

Gil Weigand, Deputy Assistant Secretary for Defense Programs at DOE and who offered the "momentous occasion" comment, championed teraflops (trillions of operations per second) computing and created DOE's Accelerated Strategic Computing Initiative (ASCI). Himself a former Sandia computer scientist and manager at a time when the Labs was pioneering massively parallel computing in the face of vociferous outside opposition, Weigand said the teraflops initiative goes back to 1989. He praised the huge number of people who brought (Continued on page 4)

## Sandia's 'Revolution in Engineering' goes to D.C. June 26

Sandia is going to Washington — big time!

Sandia engineers will be in Washington, Thursday, June 26, to demonstrate how high-performance computing and science is providing a tool to engineer products — from weapons parts to consumer products — faster, better, and cheaper.

Titled "Leading the Revolution in Engineering," the daylong event will be held for media, industry, academia, representatives of Congress and their staffs, and other government agencies. The revolution is defined as using the power of high-performance computing (such as that provided by the teraflops "ultracomputer") and science-based algorithms to move engineering from a lengthy test-based design, prototype, test, and (Continued on page 5)

## Sandia wins eight R&D 100 awards

As we went to press, the *Lab News* learned that Sandia has won eight R&D 100 awards, either individually or jointly.

The winners were: high-performance storage system, Aztec software library, nonvolatile field effect transistor memory, Filmetrics F30 optical probe, GEOSEIS minihole seismic blast initiation system, biological microcavity laser, CLIP-C closed-loop induction process controller, and PQ 2000 power quality system.

More on these in our next issue.

# Sandia LabNews

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## Robinson promotes Internet as tool to foster Russian defense conversion

Concept emerged during trip to Russia with Sen. Jeff Bingaman

By Bill Murphy

The Internet, with its unparalleled capability to facilitate interactive global communication and its potential for fostering new modes of commerce, may be the next tool of choice for Russian weapons labs as they advance their defense conversion agenda.

That is one of the outcomes of a recent visit to Russia's nuclear weapons research laboratories and other locations by US Sen. Jeff Bingaman

and Sandia Labs President C. Paul Robinson. Also part of the delegation were International Security Programs Center 5300 Director Tom Sellers, Sandia Russian expert Patricia Newman (5331), several Senate staff members, DOE official Mike McClary, and Los Alamos scientist Mark Mullen.

The Russian trip came about, Paul said in an interview with the *Lab News*, at the request of Sen. Bingaman, who, with the retirement of Sen. Sam Nunn, is picking up significant new Armed (Continued on page 6)

Radiation detector work earns Sandia's first <i>Discover</i> award	3
Agreement transfers integrated micromachines to industry	5
Labs' PV systems power Salinas national monument facilities	7

# This & That

**Nap time at Sandia?** - I saw on TV several weeks ago that some work environment experts are now touting the value of short office naps, saying they refresh you and improve your productivity. I'm thinking about submitting this as a possible topic for Paul Robinson's next round of employee dialogue sessions (see page 6) to see what he thinks about the possibilities at Sandia. Maybe Paul and the VPs could sanction employee naps at their next SQLC meeting. (Several VPs reportedly nap during those meetings, but I hesitate to publish names.) I suggest 10-11 each morning and 2-3:30 each afternoon.

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**Good news for "open network" employees** - Sandians who don't have access to our Internal Web but who are hooked to the EON (External Open Network) or CON (California Open Network) can now access detailed employee information. See the new Employee Locator link on your open network home pages; it gives you employee phone numbers, fax numbers, e-mail addresses, department numbers, titles, and more.

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**Why we limit employee information on the External Web** - As Sandia's External Webmaster, I hear from Sandians and people elsewhere asking why we don't offer more information about employees and organizations. All we provide from our regular External Web (EW) employee locator site (<http://www.sandia.gov/cgi-bin/emplloc>) is an employee's phone number, e-mail address, fax number, and mail stop (provided only after someone types in your name). So, if someone outside the Labs knows your name and needs to contact you, they can find out how by using the employee locator, but they can't find out any more about you from the EW. That's exactly what we intended, for security and privacy reasons.

Some Sandians working from home computers or elsewhere say they sometimes need to find employees' organizations, building and room numbers, and more via the External Web. For reasons stated above, we can't do that, but it is possible for Sandians who have a genuine need to access this type of information to connect to the Internal Web remotely; if you believe you have such a need, contact the Corporate Computing Help Desk at 845-2243.

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**A golfing incident?** - If you like strange glances and goofy questions, come to work with a black eye or cut on your face. I came in on a recent Monday with a one-inch-or-so cut and two stitches on my forehead. After several explanations that no one seemed to believe, I started telling everyone I was injured in a "golfing incident." I said I told my wife (Rena, 6001) to get herself in the kitchen and fix my dinner, after which she promptly hit me with her nine iron. Some people seemed to believe that, but I admit now that I stretched the truth a bit. She only threw a golf ball at me. I must work on my quickness!

- Larry Perrine (845-8511, MS 0167, [lgperri@sandia.gov](mailto:lgperri@sandia.gov))

## Lynn Jones returns as Laboratory Services VP

Lynn Jones, who has been on leave of absence from her position as VP of Laboratory Services Div. 7000 since last fall, will return to that position on July 1.

During her leave, Lynn headed the Lockheed Martin team formed to respond to a DOE Request for Proposal to rebid the contract for the environmental management program at the three DOE facilities in Oak Ridge and at the gaseous diffusion plants in Ohio and Kentucky. Lockheed Martin, however, recently elected not to rebid

that contract.

During Lynn's absence from Sandia, J.D. Martin served as acting vice president of Div. 7000. He retired June 5.

## ★ Congratulations

To Amanda and Alan (1275) Righter, a daughter, Nicole Hae-Jee, born Sept. 27, 1996, arrived Feb. 3.

To Mary Sheldon (14303) and Louis Gonzales, a son, Jaylen Luis Gonzales, April 8.

To Lauren Dyer and Dave (5511) Swahlan, a daughter, Amy Elizabeth, May 2.

To Angie and Craig (6614) Parr, a son, Alexander Mitchell, May 2.

To Shurette Riley (4423) and Jason Osheroff (4423), married in Albuquerque, May 25.

## History book copies expected by July 21

Barring any unforeseen problems, the new general history of Sandia, titled *Sandia National Laboratories: A History of Exceptional Service in the National Interest*, is due from the printer on July 21. Deliveries will be made soon after that to those who ordered copies. The people in Sandia's History Program thank you for your patience. If you have questions, please contact Carl Mora at 844-8011, Rebecca Ullrich at 844-1483, or Myra O'Canina at 844-6315.

## New 14000 Deputy VP to serve as neutron generator production manager

Lenny Martinez, Director of Product Line Realization Center 14400, has been named Deputy Vice President of Division 14000, where he will serve as production manager. Division 14000 has primary responsibility for manufacturing neutron generators, a role it assumed as part of a DOE consolidation process that closed the neutron generator production facility at Pinellas in Florida.

Lenny brings to his position 22 years of experience in a wide variety of manufacturing functions, including general and international management. Before coming to the Labs, Lenny was production manager at Digital Equipment Corporation's Albuquerque plant and was General Manager of Digital de Mexico.



LENNY MARTINEZ

Although the deputy VP title is not widely used at Sandia, it is not unprecedented, either. When former Finance VP Gary Riser first came to Sandia, he served as deputy to VP Paul Stanford.

### More deputies?

Sandia President C. Paul Robinson says the Labs may see more deputy VPs in the years ahead.

"I've always been a believer in deputies," he says. "Particularly in an area of transition, it's a great way to do business. We hired Lenny originally with the intent that he would manage Sandia's neutron generator production. What happened, though, is that there was a longer run-up to production than we had anticipated.

"At this point, we are well into that transition to full production. We felt, and Gary Beeler [Division 14000 VP] felt, it was time for Lenny to take on the overview look instead of just carrying out his director's responsibilities that he was doing. So we took this step to get him ready to perform the job as our production manager, the job we always had in mind for him."

Lenny's manufacturing experience covers a wide variety of functions, including production operations, materials management, personnel, and technology management — including quality and general plant management.

His career achievements include developing and expanding a manufacturing system's output tenfold while reducing nonmaterial spending. This manufacturing system achieved world-class cost-competitiveness on the price-volume curve for like products.

As General Manager of Digital de Mexico, Lenny oversaw commercial sales growth of 30 percent and manufacturing export growth of 136 percent.

### A production background

Lenny's educational background includes degrees at the DeVry Institute of Technology and the University of Phoenix. He completed the Executive Management Education program through the Institut Prive d' Enseignement Supérieur (INSEAD) and recently earned an MS in management from Stanford University.

Paul Robinson says having an individual of Lenny's capabilities and background involved in the production process has been "a great learning experience" for the Labs.

"Particularly, it's been very good having Lenny as we move in production folks from Pinellas," he says. "Lenny has really helped us make sure we don't create a two-caste system here, with R&D on the one hand and production on the other.

"The effect he's having on morale out there [in Division 14000] is great. I'm delighted to have him step up to the wider job."

—Bill Murphy

## Sandia LabNews

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**LOCKHEED MARTIN**

# Ralph James' detector work wins 1997 Discover Magazine Award for Technological Innovation

Materials scientist receives Sandia's first prestigious 'Academy Award of Technology'

By Nancy Garcia

Already recognized as an authority with one of the longest lists of scientific citations in his field, Ralph James of Materials Processing Dept. 8230 will soon receive attention from some 7 million members of the general public who are expected to read about his 1997 *Discover* Magazine Award for Technological Innovation in the July issue of the magazine.

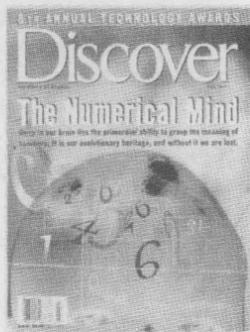
James is the first Sandian to win recognition in this event, now in its eighth year. One of eight winners, he was recognized for development of radiation detectors that can distinguish between different isotopes and operate without cumbersome cooling systems at a fraction the size of current devices. Ralph is a solid-state physicist who has researched this area over the last decade. He leads a team that has pioneered the understanding of crystals of a novel semiconductor, cadmium zinc telluride, that creates an electrical signal that is a signature for gamma rays.

His award was presented in a gala ceremony the night of May 31 at Disney World's Epcot Center by Miss America Tara Holland and retired astronaut Story Musgrave, who is credited with fixing the Hubble Space Telescope. Earlier that evening, Secretary of Energy Federico Peña met with Ralph and six other finalists from DOE laboratories. Ralph was accompanied by research team member Richard Olsen (8230) and Integrated Manufacturing Systems Center 8200 Director Al West, representing California Laboratory 8000 VP Tom Hunter.

Before and after the ceremony, Richard and Ralph helped staff a two-week display at Epcot on the detector technology. The display has also been staffed by Eilene Cross, Jim Lund, and Bruce Breunett of Dept. 8230 and Tony Sorensen of Health and Safety Dept. 8421. Sandia's work will be featured until next year with other winners at an Innovations exhibit hall at the science and technology park.

Among DOE labs, Oak Ridge and Pacific Northwest also had winning entries this year. The 33 finalists were drawn from more than 4,000 nominations that were either invited by the magazine editors (as was Ralph's), sent in by various institutions, or submitted by readers.

The ceremony honored eight individuals altogether in seven categories. An independent panel



of judges selected Ralph's work with cadmium zinc telluride radiation detectors from among five finalists in the "sight" category. In the "environment" category, retired Sandian Thomas Brumleve was a finalist for his 25-year advocacy on behalf of the molten salt technology used to store heat in the Solar Two power plant operated by Southern California Edison. The Solar Two project is also profiled in the July issue of *Discover*.

Winners received advance copies of the magazine, which was due at newsstands June 13. Although the award singles out individuals for recognition, all the technologies involved represent team efforts. In Ralph's case, progress has accelerated in the last three years, drawing on efforts of many Sandians.

"The scientific community has been waiting for years for this type of technology," Ralph said after the event. "It's really an enabling technology that's going to allow a lot of new things to be accomplished."

In addition to being able to distinguish special nuclear material and address the threat of nuclear smuggling, arrays of these sensors can image tumors that have been labeled with a radioactive tracer for more precise surgical treatment.

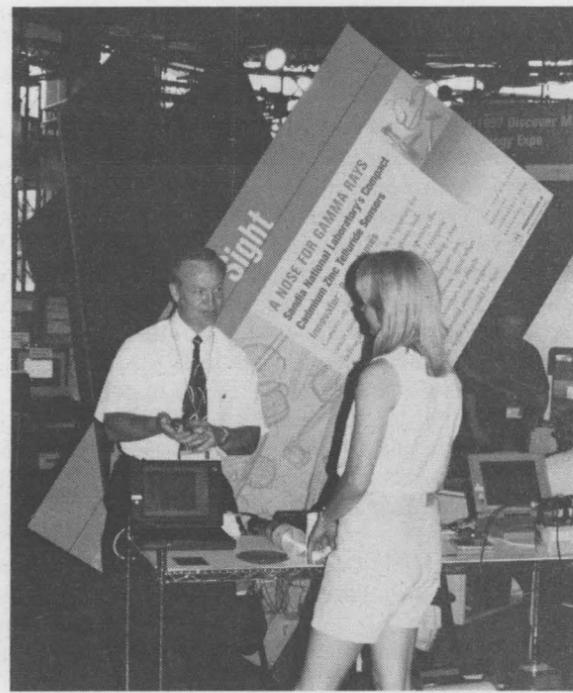
Ralph said a medical imaging device being evaluated by the Food and Drug Administration has been produced by Digirad Inc. of San Diego. It would permit surgeons to see cancerous tumors about 100 times more distinctly. With this ability, he said, surgeons could verify removal of invasive fingers and boundaries of solid tumors, while sparing as much healthy surrounding tissue as possible.

## The threat of nuclear smuggling

Work is continuing on growing large, flawless crystals of cadmium zinc telluride to detect weak radiation sources or operate at greater distances. Medical imaging applications require crystals roughly 500 square millimeters or larger in area (about an inch square), while nuclear monitoring requires crystals of only 25 square millimeters.

The prestigious recognition, Ralph said, "affirms US concerns over finding technology to try to address the threat of nuclear smuggling." Already, stored nuclear pits of dismantled weapons are being monitored with sensors placed directly on the storage drums. Any change detected by these devices, which can operate some five years without maintenance, would turn on other sensors and notify security staff. Use of these sensors to count radioactive decays is being shared with the former Soviet Union to increase global security, he said, although systems to identify specific isotopes may be restricted.

Other uses for the sensors include environmental monitoring and cleanup, such as the



EPCOT EXHIBIT — Ralph James describes his gamma-ray detector to a visitor at his Epcot Center exhibit on the weekend his award was announced.

## Sandia California News

potential to track and identify stored wastes at the Hanford facility. These crystals may also be applied to the identification of nonradioactive materials. This works by combining a semiconductor X-ray sensor with a small, natural source of gamma radiation to excite molecules of an unknown material and identify it through X-ray fluorescence. This way, it is possible to identify and quantify 80 different elements — almost the whole periodic table. Ralph believes that current materials-identification sensors could be made more affordably by using cadmium zinc telluride. Ralph's work has led to several patent applications. They are motivated by a desire to protect Sandia's ability to continue researching this field.

"Entrepreneurs see a need and try to fill it," Ralph said. "I think as an innovator, I'm more interested in creating a need; . . . benefiting society is an elemental component of doing research, for me."

## Recent Retirees



Larry Borello 30  
2265



Jan Collins 19  
8411



Jackie Garrett 35  
8812



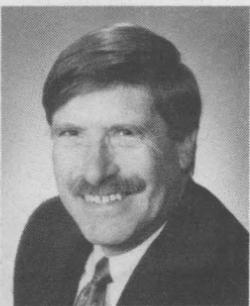
Jack Pons 24  
8240

## Supervisory appointment

RALPH CLARK to manager of Engineering for Instrumentation Systems Dept. 8411.

Ralph joined Sandia at the California site in July 1966 as an MTS electrical engineer in the Test Department. Next he moved to the Exploratory Systems Department, where he was responsible for electrical system design on the Nosetip Recovery Vehicle program.

After that he was with the B83 project group working on electrical components for the Modern Strategic Bomb. Then for 10 years he was part of the Telemetry and Instrumentation group as lead telemetry design engineer, mostly involving flight testing of the W87 warhead for the Peacekeeper missile. For the past five years he



RALPH CLARK

has been lead electrical engineer with the W87 project group.

Ralph's education includes a bachelor's degree in electrical engineering from Oregon State and then a master's in the same field from UC Berkeley, earned while he was working at Sandia. He was named a DMTS in 1995.

He and his wife, Ruth, are active in the First Presbyterian Church of Livermore. He enjoys camping, boating, tennis, and woodworking. They have two sons, one married, the other a senior in college.

## ★ Congratulations

To Kim (2262) and Tim (8713) Shepodd, twins — a daughter, Kayla Hope, March 23, and a son, Ryan Spencer, March 24.

To Michelle and Danny (8812) Bernacil, a son, Devin Connilee, Feb. 27.

To Melanie (8100) and Glenn Arace, a daughter, Alyssa, March 29.

# Teraflops

(Continued from page 1)

Dec. 20, 1996). That demonstration, however, was achieved using 7,264 Pentium Pro processors in 57 cabinets, or three-fourths of the full machine.

## Computational stockpile testing

"Teraflops computing and ASCI provide an extraordinary opportunity for the three weapons laboratories in DOE to work together on behalf of the science-based stockpile stewardship program," says Sandia President and Laboratory Director C. Paul Robinson. "It is a very important step in shifting from a test-centered program to a computational-centered program."

The teraflops computer ushers in a new era in which high-fidelity 3-D simulation will enable scientists to reach the eventual goal of preserving a safe, secure, and reliable nuclear deterrent without underground testing. Sandia scientists and engineers already have been using the computer to calculate stockpile-related problems.

"The outstanding applications software development skills of Sandia and our

DOE partners complement Intel Corporation's superb computer hardware capabilities to create a dynamic combination that promises to revolutionize computational science in many disciplines," says Bill Camp, Director of Computational Sciences, Computer Sciences, and Mathematics Center 9200.

The \$55 million teraflops computer and its more powerful successors under the ASCI program are needed to simulate the complex 3-D physics involved in nuclear-weapon performance and to accurately predict the degradation of nuclear weapons components as they age in the stockpile. Powerful multi-teraflops computers also will permit analysts to quickly run full-system 3-D simulations of complex accident environments, such as an airplane crash followed by a fuel fire.

The fastest computer prior to the completion of the teraflops was a special-purpose Japanese Hitachi computer that reached the 368 gigaflops (billion floating point operations per second) mark, a record that stood until last December's achievement of 1.06 teraflops. Sandia scientists have since achieved 1.28 teraflops and just recently 1.338 teraflops on the new ultracomputer and expect that to go higher in the near future.

## Media event

(Continued from page 1)

to realization a "new type of computing" and proved everyone wrong who said a trillion operations per second would never be achieved.

When the trillion-operations-per-second goal was set in 1989, Weigand said, that power was a thousand times beyond the then-current capabilities.

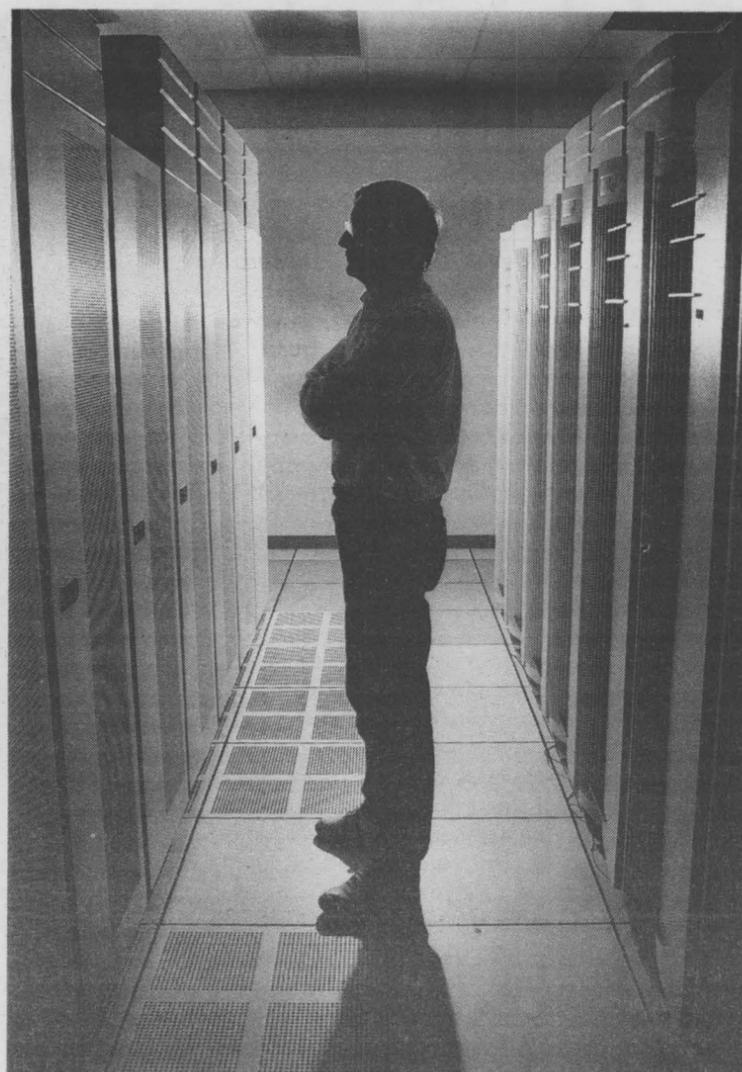
"It was an eight-year program. A lot of people not here deserve our accolades and thanks." He said about half are at Intel and the other half are at Sandia. "This is not my doing, it is theirs. They achieved goals greater than could have been expected just a few years ago." He said they proved the naysayers wrong. They made it work, they created the software, they set the records. "It is an enormous achievement."

The ability to set an almost impossible-seeming goal and then to achieve it is a kind of "demonstration-based deterrence" that serves the nation's security and future well, Weigand said. "It is a demonstration of your will and your ability."

"This is currently the largest supercomputer ever built and in operation," said Bill Camp, Director of Computational Sciences, Computer Sciences, and Mathematics Center 9200. Up to this point, Bill said, "It's the biggest day in the history of supercomputing." He expects more to come.

The computer's maximum theoretical output is 1.8 trillion operations per second. Bill said it has achieved 1.338 teraflops on test problems. But he said it has already been used to carry out a number of real applications in which it operated variously at 300 to 500 billion operations per second over periods of many hours.

He and Weigand emphasized its crucial importance in working on what



TAKING IN THE T-FLOPS — Ken Lord, senior on-site analyst from Intel Corp., pauses between two rows of cabinets that are part of the new Intel teraflops supercomputer in Bldg. 880. (Photo by Randy Montoya)

Weigand called "tough and challenging national security problems" in a climate in which weapons in the stockpile must be assured to be safe and reliable but no further nuclear tests are authorized. High-performance supercomputing simulations are the best alternative.

"It is already being used to carry out redesign of major components in nuclear systems," Bill said.

"It's a tremendously momentous occasion," said Dick Ammerman, program manager for Intel's Scalable Systems Division in Beaverton, Ore. Intel has announced that the teraflops machine will be its last supercomputer, having decided to focus on its mainstream computer-chip businesses, but Weigand assured everyone that future DOE-sponsored supercomputers for a long time to come are likely to have "Intel Inside."

## Three problems already attacked by teraflops computer

Sandia scientists and engineers have achieved the following calculations so far on one-fourth to three-fourths of the full teraflops supercomputer:

**100 million-cell calculation models performance of ballistic weapon system:** Sandia scientist Marlin Kipp (9232) has completed an unprecedented 100 million-cell CTH code calculation that modeled the performance of a ballistic weapon system employed in the contact fuzing mode. Never before has the computing capability (memory size) been available to model, in 3-D and with greatly enhanced resolution, the entire region of interest in the weapon for this event. These recent calculations with the teraflops machine have demonstrated that Sandia scientists are now beginning to be able to address the various issues involved in certifying fuze performance in a single, full-system simulation of the event. This is an important aspect of DOE's Accelerated Strategic Computing Initiative (ASCI), designed to provide the higher-resolution, three-dimensional physics modeling needed to evaluate the aging nuclear weapons stockpile without actual testing.

The challenge was to simulate the several "time races" involved in the fuzing and firing of the weapon, evaluating the vulnerability of critical fireset components to impact and primary explosive detonation shocks. Certain components, such as neutron generators, must be isolated from shock damage long enough after impact (fractions of a millisecond) to per-

form their respective function in the firing sequence before being destroyed by the impinging shock waves. The time margin for component survival will depend strongly on such things as the impact velocity, angle, and target materials. Numerical simulations, tied to limited test data, can provide detailed performance evaluations for system impact conditions that cannot be tested.

**Computer model of comet striking the ocean shows teraflops capabilities to DOE:** At the request of DOE for the dual purpose of generating unclassified data to test visualization techniques and to assist in installation testing of the new teraflops computer, Sandia scientist David Crawford (9232) performed a computational simulation using the CTH shock physics hydrocode. The calculation, consisting of 54 million zones, ran for 48 hours on 1,500 processors of the teraflops.

The problem modeled a one-kilometer comet, weighing about 1 billion tons, traveling 60 kilometers a second, and striking the Earth's atmosphere at a 45 degree angle. The calculation showed that large quantities of ocean water would be vaporized by the tremendous energy of the impact and ejected into suborbital ballistic trajectories that reenter worldwide. The result would be devastating tidal waves and a cloud of water and debris enveloping the globe that would affect the Earth's climate (*Lab News*, April 25, 1997).

**Can-crushing problem shows power of 'measured scalability':** A large group of Sandia scientists including Steve Attaway (9118), David Gardner (9221), and Bruce Hendrickson (9226) recently developed and demonstrated software that is the first to enable large finite-element models to be run efficiently on hundreds or thousands of processors in distributed-memory parallel computers such as the teraflops. Called the Parallel Material Contact Software, it enables scientists and engineers to perform computer analyses of larger, more complex systems than ever before, faster than ever before, and with greater accuracy. The ability to distribute a problem to great numbers of processors on a parallel computer is called scalability.

The software has been used to simulate the crushing of a thin-walled cylinder by an inclined block. As the can crumples, the buckling and consequent material contacts are computed dynamically. Running on 512 processors, with each processor handling 1,875 hexahedral elements, scientists are simulating a model with almost one million elements.

The Parallel Material Contact Software is currently used at Sandia in the PRONTO3D, JAS3D, and ALEGRA computation mechanics codes and is enabling scientists and engineers to conduct finite-element simulations of unprecedented resolution in such areas as nuclear stockpile stewardship problems, reservoir modeling, and structural dynamics problems.

# Smart micromachine technology licensed to Analog Devices Inc. to help birth second silicon revolution

By Neal Singer

The day when automobiles and other vehicles are made still safer by tiny machines each no bigger than a thumbnail is approaching more rapidly because of an agreement signed between Sandia and Analog Devices Inc. of Woburn, Mass.

Sandia has licensed Analog — an industry leader in the manufacture of airbag micromachine sensors — to commercialize the technology used to make Sandia's integrated micromachines.

An integrated micromachine is a tiny "smart" machine that combines microcircuits, sensors, and actuators on a single computer chip. Sandia is a world leader in this field.

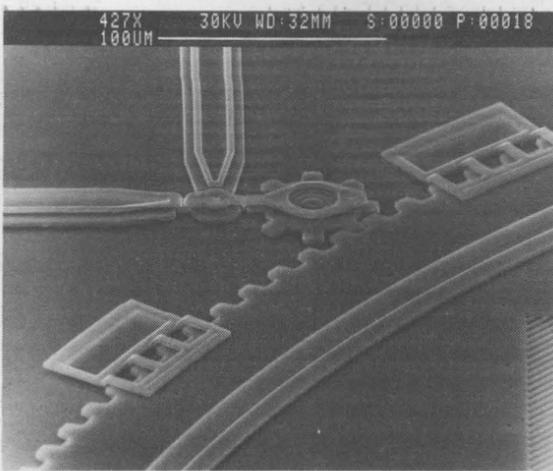
The agreement is expected to help stimulate production of a new generation of very small consumer and military devices, such as antitamper, antiskid, and active-vibration-control systems.

"Devices we envision represent a second silicon revolution," says Paul McWhorter (1325), manager of the Laboratories' micromachine effort. "We're not simply adding more, smaller transistors to a chip. We are adding functions that sense and act."

## May be Sandia's largest partnership

While the exact business terms of the agreement are proprietary, because of market size the nonexclusive license is anticipated to be the largest partnership of its kind ever signed by Sandia. It inaugurates a substantial multiyear business relationship between Sandia and Analog. The specific market for micromachine-based inertial sensors worldwide is estimated to be \$3.8 billion, says Paul.

"Traditionally, the focus of the microelec-



INTEGRATED MICROMACHINES combine on a single computer chip micromechanical devices like the ones seen here with tiny circuits and sensors.

tronics industry has been to continue to pack more transistors onto a chip, leading to more powerful computers," he says. "This agreement will break this trend by focusing on the development of chips with not only electronics but also small machines. These give chips the ability to sense where they are and what is going on around them."

The long-term license involves transfer of Sandia's intelligent micromachine technology to Analog Devices. Several published market studies project this industry to reach \$8 billion to \$12 billion by the year 2000, says Angelo Salamone (4211), who manages commercial business relationships for the Lab's microelectronics defense technology transferred to industry.

"The up-front money will help transfer tech-

nology from Sandia to Analog," he says. "Royalty payments will help pay for further research."

Funds from the Defense Advanced Projects Research Agency will aid in the cost of transferring the technology. "Ordinarily, DARPA funds industry to do high-risk, defense-related projects," says Paul. "In this case, if the Air Force needs, say, an accelerometer, it'll be able to buy one from Analog."

Analog uses micromachines to signal when a vehicle is undergoing sufficiently rapid and sustained deceleration for the airbag to deploy. The company is a pioneer in the development of commercial products based on micromachined devices.

Researchers at the University of California at Berkeley's Sensor and Actuator Lab, credited with making some of the earliest known micromachines, also will be involved in designing new, smarter products.

Because batches of silicon micromachines can be fabricated through manufacturing techniques already widely used to make integrated circuits, micromachines are far cheaper than the complicated multimetal constructions originally necessary to signal an airbag to inflate. Rather than being made individually, micromachines can be fabricated quickly and cheaply by the thousands.

Also, because the machines have so little weight, they are less likely to be damaged by sudden deceleration, because force is proportional to mass — which, in this case, is almost nonexistent.

"This license represents the latest of more than 180 commercial agreements successfully concluded to transfer Sandia-developed defense technology to private industry," says Angelo.

## Sandia to D.C.

(Continued from page 1)

refine process to a simulation-based process that creates reliable virtual designs and tests through computer simulations and modeling.

"We will use the computer to simulate, refine, and optimize the performance of systems across their life cycle. Experiments will be used to validate and create these simulations," says Russ Skocypec (9102). "Actual tests of complete products will be minimized."

Demonstrations are planned in the areas of oil and gas exploration and production, crash-and-burn system response, manufacturing, and computing for insight — how computer modeling and simulations can broadly help improve our understanding. The role of high-performance computing in ensuring the safety, reliability, and security of the nation's nuclear stockpile will also be highlighted.

The simulation-based approach will provide a competitive advantage for high-value, high-consequence products, says Paul Hommert, Director of Engineering Sciences Center 9100.

### Sandia is 'showing the way'

Bill Camp, Director of Computational Sciences, Computer Sciences, and Mathematics Center 9200, says that among the benefits will be decreased time to market, optimal designs, the exploration of new and innovative concepts, predictive aging, and the characterization of catastrophic failure conditions. And on top of that, computerized engineering is environmentally friendly.

"You've heard the slogan, 'Where do you want to go today?' The revolution slogan will be 'What do you want to create today?'" Russ says.

Gerry Yonas, VP for Information and Pulsed Power Research and Technology Div. 9000, says realizing the full integration of high-performance computing and science into engineering is just now beginning but should become the standard engineering process over the next two decades.

"There are many in industry, and some here, who frankly are still very skeptical about this," Gerry says. "This is a vision and it may take

## Six 'revolution in engineering' presentations

The presentations scheduled for the Washington event and their presenters are:

- *Revolution in Engineering* — Russ Skocypec will outline the "revolution in engineering" concept and discuss how the simulation-based approach to engineering can provide Sandia, industry, and the nation as a whole a competitive advantage.

- *Safety, Security, and Reliability* — Paul Hommert will discuss the overall importance of high-performance computing and DOE's Accelerated Strategic Computing Initiative for ensuring the safety, security, and reliability of the nation's nuclear stockpile.

- *Teraflops* — Sudip Dosanjh (9221) will present information on the teraflops computer, built by Intel Corp., relating how the new "ultracomputer" represents a giant step in computing power that can be used for a variety of tasks (see separate story beginning on page one).

- *Manufacturing* — Harold Morgan (9117) and Steve Kempka (9111) will discuss how Sandia is using high-performance computing

to make products more quickly, more uniform, and with fewer defects.

- *Crash and Burn* — Carl Peterson (9116) and Bob Thomas (9118) will show how Sandia engineers use 3-D physics modeling to create simulations of catastrophic events such as an aircraft crashing with a nuclear weapon aboard.

- *Oil and Gas* — David Womble (9222) and Elaine Gorham (9104) will demonstrate how Sandia is using high-performance computing and specially developed software to help the oil and gas industry locate and retrieve the nation's remaining oil and gas reserves more efficiently.

- *Computing for Insight* — Chuck Meyers (4523), David Crawford (9232), and Carl Diegert (9215) will discuss how Sandia scientists are creating simulations from massive amounts of data, either computationally generated or measured, that allow them to "see" how an event unfolds, such as a one-kilometer comet crashing into the Atlantic Ocean (*Lab News*, April 25).

another 10 years to realize, but within 20 years this will be the standard way of engineering. Our lab is showing the way."

Gerry says Sandia may be taking some chances in pushing the revolution concept at this point, but that a leadership role will pay off in the long run.

"It's like Babe Ruth pointing to the outfield wall," he says. "In Washington, we will sort of be pointing to the fence."

There are several reasons for having the event in Washington. In essence, it's the one place in the country where Sandia can reach so many constituencies, including Congress, industry, academia, and national media, at the same time.

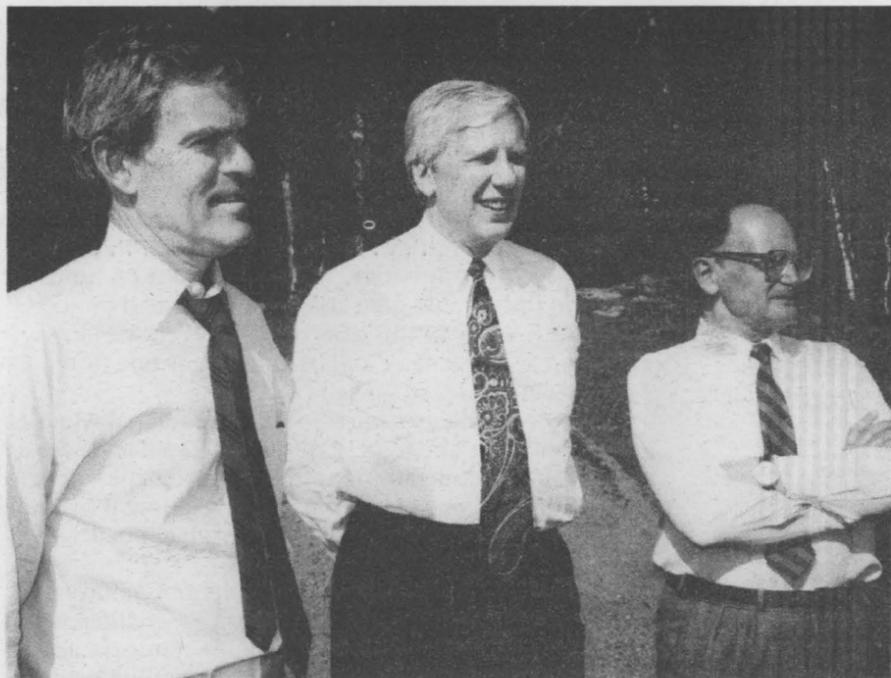
Besides delivering the message about the revolution in engineering, Sandia hopes to form new partnerships for future collaborations and funding. Sandia, for instance, is using its high-performance computing capabilities to help Goodyear design a

better tire.

"We want people who will team with us like Goodyear," Gerry says.

Several Sandians in the various technical areas and in Public Relations and Communications Center 12600 have been working to put together the Washington event, which will include exhibits, virtual reality computer demonstrations, and live presentations of work currently under way. Sandia President and Laboratories Director C. Paul Robinson will lead off the presentations to media in the morning, as well as to Congressional staff, industry, and academia at the afternoon presentation, which begins with a luncheon.

DOE Secretary Federico Peña is tentatively scheduled to appear at the event. Lockheed Martin CEO Norm Augustine is scheduled to respond to media questions during a late-morning media availability. — Chris Miller



SEN. JEFF BINGAMAN (left), Sandia President C. Paul Robinson (center), and Academician Evgeny Avrorin pause for a moment during a stroll on the shore of a lake near Chelyabinsk, Russia. Avrorin is director of the nuclear weapons research laboratory at the closed city of Chelyabinsk. During the US delegation's visit to the laboratory, participants discussed the idea of using the Internet to foster technology transfer.

## Trip to Russia

(Continued from page 1)

Services Committee responsibilities in the area of US-Russian relations.

"I think it's great to have Jeff assume that role, because there is a gap of senators who are really knowledgeable about the problems Russia faces as it transitions from the Cold War era," Paul said. "He [Sen. Bingaman] asked for Sandia's help in coming up to speed on what's going on in Russia. One of our suggestions was, 'Well, there's nothing like seeing it for yourself to really understand.'"

The Russian weapons facilities, specifically Chelyabinsk and Arzamas, Paul said, are based in so-called "closed cities," a relic of the Cold War. Although much of Russian society is opening up, the secret cities are still closed, and the people who live there — Russian counterparts of Sandians, Los Alamosans, and their families — want to keep it that way.

"I was a little surprised by that," said Paul, "but then, having lived in Los Alamos for a bunch of years, maybe not too surprised."

Paul said the residents of Chelyabinsk and Arzamas perceive that beyond their fences social conditions are deteriorating. In particular, Paul said, they see that crime is a growing problem in the rest of the country while in the closed cities there essentially is no crime.

"But here is the convincing argument to me," Paul said. "The whole issue of [special nuclear] material protection would get a lot more fragile if there were active organized crime components within their cities, which could very well happen if the cities were opened."

"And so I thought, 'Maybe they're right.

## Employees invited to suggest topics for July dialogue sessions

Sandia President Paul Robinson invites Sandians to suggest topics they would like to hear discussed at the next round of employee dialogue sessions July 28-31.

Suggested topics and questions can be e-mailed to Paul's assistant, Jane Elson, mjelson@sandia.gov, or mailed to her at MS 0101. Anonymous suggestions are welcome. If you prefer to submit suggestions anonymously via e-mail, send them to Larry Perrine (12640) at lgperri@sandia.gov; he will remove your name and then forward your suggestion(s) to the president's office.

Paul's main topics will be announced in the July 18 *Lab News*; please submit suggestions by no later than Tuesday, July 8, to allow Paul time to determine his main topics and for the *Lab*

News to meet its copy deadline. Although Paul may not be able to cover every topic/question submitted in the one hour allotted for each session, he will cover those issues that are of the greatest interest Labs-wide.

### Defense conversion & material security

Here's the problem, then: How do you sustain defense conversion, how do you work with industry and the marketplace if you are in a closed city?

"Industry is not going to travel out there [to the Urals in the case of Chelyabinsk]," Paul said, "and their [the labs'] security systems present a huge barrier to any industrial visitors."

What to do? "We came up with the idea that the Internet just might be their best solution," Paul said. He noted that at a recent Microsoft conference on the future of the Internet, a lot of questions were asked about when companies will be able to actually make money and carry out real commerce in a significant way through the Internet.

"I think we have a great prototype [with the Russian labs]," Paul said. "We'll see that individuals will be able to propose work, get contracts, carry out work, and deliver thought-work products — all through the Internet. If ever there were a better case to try it, I don't know what it would be."

Paul noted that the Russian labs have access to the Internet via their collaboration with Sandia on security processes. As a result of that collaboration, with its use of satellite-based video-conferencing and data exchanges, Paul said, the Russians are beginning to see what a powerful tool a modern computer communications capability can be.

Initially, Paul said, the leadership at Arzamas had been more wary than their counterparts at Chelyabinsk of working with Sandia to establish satellite-based video and Internet connections. However, after a New Mexico-to-Chelyabinsk

Maybe the cities ought to stay closed for now.' Even though we've done a lot in lab-to-lab programs trying to teach methodologies for securing nuclear materials, we have not made huge inroads into the percentage of material that needs to be locked up. So far, we've just begun to scratch the surface. There's still a lot of material that needs to be locked up, needs to be protected."

These considerations, Paul said, present the Russians with a classic Catch 22 scenario: defense conversion — what we might think of as technology transfer — is purportedly a high priority for Rus-

sia's research complex. But so is the protection of special nuclear materials. One priority is fostered by the closed-cities approach, one is impeded by it.

demonstration teleconference (*Lab News*, June 6) turned heads and got tongues wagging in Moscow, the Arzamas leadership had a change of heart, he said. Arzamas's perspective on the utility of the Internet also got a boost, Paul said, when it proved useful in helping to resolve — almost instantly — some medical questions that emerged in the wake of an accident that involved a minor release of cadmium. During the emergency, the Internet provided the information they urgently needed for medical treatment.

"Now," Paul said, "Arzamas is equally excited [with Chelyabinsk] about using the Internet as a tool that will let them get started on conversion, while keeping their closed cities closed until they get the [special nuclear] material locked up."

### Architect of reform

In addition to visiting Russia's key weapons labs, the delegation met with Yegor Gaidar, one of the chief architects of reform in Russia, and now the head of a small think tank in Moscow. Although he is not in the government, Paul said he believes Gaidar, whose office is very close to the Kremlin and receives tight, state-provided security, remains a chief confidante of and adviser to Russian President Boris Yeltsin. "Gaidar is a remarkable man," Paul said. "I think many of us came away thinking, 'There is an intense individual who really believes in the reforms they've got to do.'"

Paul said Gaidar maintains that downsizing of Russia's military can only succeed when the military scraps its dedicated, vertically integrated supply chain that requires two civilian employees for every enlisted man.

"Gaidar told us they [the military] are still operating their own collective farms to produce food exclusively for the military."

### Reviewing Sandia's programs

One of the very high motivations for making the trip to Russia, Paul said, was to give him a chance to look at the programs Sandians are involved in, including the International Science and Technology Center programs, various official laboratory-to-laboratory efforts and collaborations, and, probably most important in Paul's view, the MPC&A — Materials Protection, Control, and Accountability program.

"I must tell you, my admiration for the individual Sandians has gone way up as I looked at the conditions they still have to work in," Paul said. "This is as hard a duty as we assign anybody; it's a lot of sacrifice that our folks make. I'm really proud of them."

Paul said the enthusiasm many Russian technical people showed for Sandia was "almost embarrassing."

"Everywhere we went, each of the facilities bragged about Sandia being an ideal laboratory to work with. As they would show us statistics, it would seem to be true that Sandia has been able to write contracts more speedily, get payments there on time, just to generally get things done. So I want to cite and congratulate our folks, especially those in Procurement who have really set the standard."

### A changing look, a long road

"I found in Moscow an attitude that I'd never seen before," Paul said. "A little bit of freedom is starting to change the look of the place. No question about it. It still has a long, long struggle ahead, and I think it's still going to be expensive to see them come up to Western standards."

"It's interesting; the 50th anniversary of the Marshall Plan in Europe was celebrated while we were in Russia. And it occurred to me that we need to ask: Should the US and other western nations consider a more proactive Marshall Plan for Russia and the states of the former Soviet Union? I think that is a vital question."

## Welcome

New Mexico — Ana Barraza, Karen Conley, Lucia Hernandez, Christina Jockle, Theresa Morales, Jeanne Torres, and Frances Whinery (all 12111); Matthew Olson (6532)  
Minnesota — Clyde Rogers (5933)  
Texas — Katrina Hyatt (12364)



Hal Post (6218) examines a photovoltaic module similar to those used in the PV array that powers the visitor's center at Salinas Pueblo Missions National Monument. In the background are the ruins of the old mission church of San Buenaventura which dominate the ridge overlooking the visitor's center. The church was built by Pueblo Indians and Spanish settlers in the mid-1600s. (Photos by Randy Montoya)

## Sun power reigns for Salinas Pueblo Missions National Monument visitor center — with Sandia's help

By Chris Miller

When Hal Post (6218) saw the woman peer through the brush and wonder aloud about the large photovoltaics array some 30 yards from the visitors' path, he was absolutely delighted.

For it's notice that Sandia photovoltaics scientists and engineers are hoping the photovoltaics system will get. And what better place to be noticed than a national monument that attracts nearly 70,000 visitors each year, despite its relative isolation 26 miles south of Mountainair, N.M.

"This is a national park and it's a perfect place to put something like this," Hal says. "Nobody wants to see powerlines overhead, or hear and see smoking diesel engines generating power in a remote location. Our national parks should be kept as pristine as possible, and renewable energy sources help to keep them that way."

The photovoltaics array, which consists of 24 Solarex MSX-60 modules, each with a rated output of 60 watts, is powering the new visitor center for Salinas Pueblo Missions National Monument. The center is located at Gran Quivira, one of three units that make up the national monument.

The monument features stone-and-adobe walls built by the Anasazis between A.D. 700 and 1300 and representing the earliest stage of the pueblo society. They are intermixed with the ruins of mission churches built by Spanish colonists in the early 17th century.

The Gran Quivira Unit of Salinas Pueblo Missions National Monument was established in 1909 and covers 610 acres. It is operated by the National Park Service.

The new 1,800-square-foot, \$275,000 visitor center replaces one built in 1935 and is scheduled to be formally dedicated in ceremonies on June 26. Sandia photovoltaics engineers, including Hal and Mike Thomas, also of Photovoltaic System Applications Dept. 6218, will be there to recognize Sandia's contribution to helping expand the use of renewable energy technologies.

The Salinas Pueblo Missions National Monument photovoltaics system is a direct result of DOE's Renew the Parks program with the National Park Service. It is the outcome of Sandia's growing partnerships with the Interior Department's National Park Service and Bureau of Land Management, the Department of Agriculture's Forest Service, and the Department of Defense. Sandia assesses what these agencies have done so far with photovoltaic solar systems as well as the potential for their expanded use.

Hundreds of existing systems have been identified, with the level of satisfaction at more than 96 percent, and a tremendous interest has been expressed in expanding the use of these systems within the agencies, says Chris Cameron (6218).

(Continued on next page)



Inspecting the photovoltaic array at Salinas are, from left, Mike Schneegas, National Park Service; Mike Thomas (6218); Glenn Fulfer, National Park Service; and Hal Post (6218). The 24 Solarex MSX-60 modules provide an aggregate output of 1,440 watts.



Hal Post, left, and Mike Thomas, both of org. 6218, hold a photovoltaic module near the entrance to a large kiva amid the ruins at the Gran Quivira unit of Salinas Pueblo Missions National Monument. The PV array that powers the monument's visitor's center consists of 24 of the modules.

# Physicist Richard Garwin wins presidential Fermi Award

*Pioneer IBM researcher and Sandia consultant honored*

By Ken Frazier

Physicist Richard Garwin, whose contributions to the nation's defense research span virtually the entire Cold War period and the years since then, has won the presidential Enrico Fermi Award, the White House has announced.

Garwin, Fellow Emeritus at IBM Research, Yorktown Heights, N.Y., and since 1995 a consultant to Sandia, will receive a \$100,000 honorarium and a gold medal. The Fermi Award is the government's oldest science and technology award.

The White House said the award honors Garwin's "contributions to a wide range of problems in science, technology, and national security policy." It added: "These achievements have been as diverse as fundamental physics of condensed matter, elementary particles and fields, nuclear weaponry, gun and bomb sights, and practical applications such as laser printers, computer touch screens, medical imaging equipment, the global positioning system, and superconductors."

He was cited also for his participation in the "formulation of national security policy. He continues to provide technical and policy advice across the field of national security and arms control."

The Fermi Award, which dates to 1956, honors the memory of Enrico Fermi, leader of the group of scientists who on Dec. 2, 1942, achieved the first

self-sustained, controlled nuclear reaction at the University of Chicago. Among the award's first recipients were physicists John von Neumann, Ernest Lawrence, Hans Bethe, Edward Teller, and Robert Oppenheimer.

Garwin received his PhD in physics from the University of Chicago, where he worked with Fermi. He spent most of his career at IBM and was a consultant to Los Alamos National Laboratory until 1993. He became a consultant to Sandia in 1995.

"He's been a consultant to me for most of my professional career," says Sandia President and Laboratory Director C. Paul Robinson. "He really is one of the brightest folks in the country."

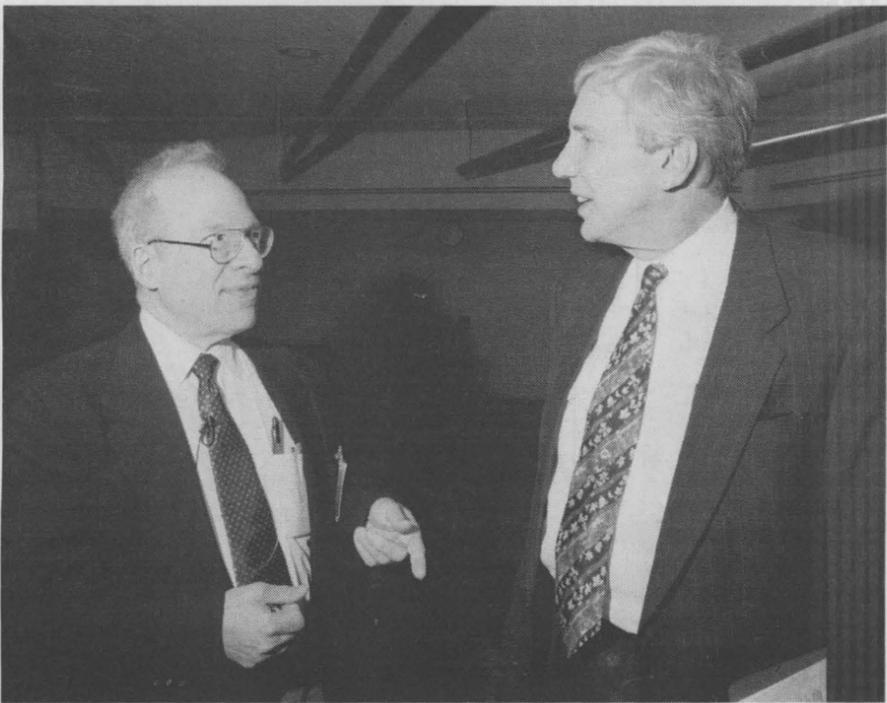
"He's not always right. We disagree a lot on philosophy, particularly on defense policy. But he is a physicist's physicist. If you would like a program reviewed and a fatal flaw that might exist uncovered, he is your man."

Two other researchers also won the 1997 Fermi Award: cell biologist Mortimer Elkind of Colorado State University and oncologist H. Rodney Withers of the University of California at Los Angeles, who are sharing the award for their work describing the response of normal and malignant cells to ionizing radiation, thus providing the scientific basis for radiation therapy of cancer.

"I am honored to recognize these researchers," President Clinton said in announcing the awards on June 11. "Their lifetime work provides an example of how science benefits the work and personal lives of Americans on a daily basis. These three men can inspire the young people of this nation who want to pursue a scientific career."

Clinton approved the awards upon the recommendation of the secretary of energy after an evaluation by a screening panel and an interagency awards committee. DOE administers the awards for the White House.

Energy Secretary Federico Peña will present the awards at a ceremony in Washington July 24.



FERMI AWARD WINNER and Sandia consultant Richard Garwin (left) confers with Sandia President C. Paul Robinson during a November 1995 visit to Sandia. Garwin gave a Sandia colloquium on the then just-declassified Project Corona, which launched 145 reconnaissance satellites from 1960-1972. (Photo by Mark Poulsen)

## Sandia 'clean room' among best engineering accomplishments of last 50 years in New Mexico

In a contest to select the finest engineering achievements of the last 50 years in New Mexico, Sandia won one first place and an honorable mention.

Plaques were presented to winners and runners-up in eight categories by the New Mexico Society of Professional Engineers, which sponsored the event, at a banquet June 7 at the Albuquerque Country Club.

The winning Sandia entry was the conception and development of the vertical laminar flow clean room, submitted in the category "economic development" by Mike DeWitte (12650). Sandia won an honorable mention for its satellite monitoring of nuclear detonations in the category "health and safety," submitted by James R. Kelsey (5700).

Criteria of the awards committee were each entry's economic impact on the state of New Mexico, as well as the entry's degree of engineering innovation, improvement in function and efficiency, and enhancement to the quality of life for New Mexicans.

Invention of the vertical laminar-flow clean room was crucial to the growth of today's huge microelectronics industry. So-called "clean rooms" use unidirectional air flows to lower the amounts of dust and other particulates in laboratories — a crucial function when circuits etched are roughly the size of bacteria, and motes of dust at that scale are boulder-like roadblocks. According to Willis Whitfield (ret.), Sandia's principal investigator on the original project, in laboratories of pre-1959 "about the best we could do fell within what is known today as class 100,000" — that is, 100,000 or fewer particles of 0.12 microns in diameter, per cubic foot of room space.

Sandia's Microelectronics Development Laboratory, constructed in 1988, operates routinely at Class 1,000. Individual labs can be upgraded to Class 1. A patent covering aspects of the laminar flow clean room was issued to Sandia in 1964.

To monitor nuclear test moratoriums, Sandia built satellite monitoring systems to survive rocket launchings, detect explosions from unprecedented distances, and operate for long periods in space.

The first Sandia instrumentation systems for atmospheric and space monitoring were launched in 1967. Those Vela satellite systems maintained 100 percent mission capability until deactivated after 14 years, a record longevity for operations in space at that time.

— Neal Singer

## Salinas monument

(Continued from preceding page)

Sandia's Photovoltaic Systems Assistance Center recently won a 1997 National Park Partnership Leadership Award with the Denver Service Center of the National Park Service for "Resource Stewardship and Preservation," which came directly as a result of its work under "Renew the Parks."

Monument Superintendent Glenn Fulfer and Facility Manager Mike Schneegas say the partnership with Sandia has helped the National Park Service plan greater efficiency into the building. In fact, the visitor center represents a new approach to providing National Park Service facilities that include sustainability and efficiency in planning, design, construction, and operation. The building has motion-sensor lights, is situated to take advantage of winter sunlight, and even has floor and wall tiles made from recycled car windshields. The PV system will operate a swamp cooler,

lights, and a computer for word-processing and e-mail, as well as an interactive computer display that will allow visitors to call up desired information about the monument.

"This has been teaching us to be conservative with our energy resources," Fulfer says.

Adds Schneegas, pointing to the ruins: "What we've done is essentially what those people did centuries ago — rely on the power of the sun and be efficient in conserving energy resources."

The photovoltaics system, Hal says, will provide on average between 7.5 and 8 kilowatts of AC electrical energy per day from April through September, and about 5.5 kW per day during the remaining months.

"With minimal air conditioner use, the PV system should meet a large portion of the total load during the summer months and nearly all the load during the winter months," Hal says. "The park will control this fraction based on just how much electricity they use, primarily for lights."

Cost of the PV system is about \$18,000, which includes a five-year full-service agreement. The cost was split about evenly between the

National Park Service and Sandia, through DOE's Renew the Parks effort.

Salinas monument actually still is connected to an electrical grid that can provide additional power when needed. The solar energy system also includes a backup DC battery with AC convertor that can provide uninterruptible power in emergencies.

The monument can sell electrical power generated by the PV system back to the grid when it is generating more power than needed. Fulfer says the National Park Service's goal is to break even and end up paying nothing for electricity.

Because of the initial cost of the PV system and the availability of an electrical grid, Hal says the project initially won't be cost-effective. But he adds, "The project's value lies in Salinas's decision to move toward sustainable energy generation in the park and the interpretive benefits of demonstrating renewable energy to the visiting public."

Central New Mexico Electric Co-op is the local service provider, and Springer Electric Co-op helped put the service package together. Direct Power and Water Corp. of Albuquerque installed the PV system.

# Sandia-developed system could lead to more efficient movement of cargo across the US-Mexican border

*System encompasses entire process from factory to factory*

By Bill Murphy

The charge from Sen. Pete Domenici in 1994 was straightforward, but that doesn't mean it was simple: Find a way to expedite the movement of freight across the US-Mexico border.

Sandia, with funding from the New Mexico Highway Department and the Federal Highway Administration via the New Mexico-based Alliance for Transportation Research, took on the challenge.

Less than three years later, New Mexico's senior senator was at the border crossing at Santa Teresa, N.M., near El Paso and Juarez, to display the results of his mandate and Sandia's efforts.

During a demonstration and press briefing, Domenici, joined by Rep. Joe Skeen, R-N.M., and other officials, was shown Sandia's ATIPE system — Advanced Technologies for International Ports of Entry. Sandia developed ATIPE from the ground up, adopting existing technologies and creating new ones, merging them into a seamless whole designed specifically to expedite the movement of commercial traffic back and forth across the border more safely, securely, and efficiently.

ATIPE, says project manager Brad Godfrey (5504), is built on three technologies: An automated tracking system, a process map that shows all the steps in shipping goods across the border, and a collaborative information system.

## The tracking system

Sandia's Authenticated Tracking and Monitoring System (ATMS) has been adapted for ATIPE. The system tracks the physical movement and status of cargo — not vehicles, but sealed, containerized goods — being shipped. ATMS, developed in Security Systems and Technology Center 5700, has been used in nonproliferation applications. For example, it has been employed in Russia, tracking the movement of special nuclear materials. The tracking system, says Brad, was readily adaptable to the border shipping challenge.

ATIPE uses satellite communication to report cargo status to shippers and border officials in near-real time via the Internet with a system developed in Information Systems Engineering Center 6500.

## The process map

The process map methodology was developed in Environmental Information and Technology Center 6600 for the demand-activated manufacturing application and customized for the ATIPE program. The process map shows the entire shipment process. The map reads like a flow chart. It depicts all the steps involved in both the physical handling of the material (like the truck moving across the border, paying tolls, being weighed), and the informational part of the process (filling out the forms, the permits, the reports, and making sure US and Mexican customs have the all the paperwork they need to approve a border crossing).

The process map, based on hundreds of interviews by Center 6200 personnel with affected parties on both sides of the border, is so detailed and thorough, Brad says, that it has been a revelation to many of those involved to see how complex the cross-border shipping process really is.

## The intelligent information system

While the tracking of cargo and the schematic of the entire process are important, Brad says the "heart" of ATIPE is the intelligent information system developed for the project based on Sandia's work with General Motors on

product lifecycle systems. The Internet-based system, Brad says, makes possible collaboration among all the stakeholders in a particular shipment — government agencies (Mexican and US), shippers, carriers, consignees, and brokers.

The best way to describe the information system is by example:

"Here's what happens with a shipment



EXPLAINING THE SYSTEM — John Gronager, Manager of Advanced Transportation Dept. 5504, explains details of the Advanced Technologies for International Ports of Entry (ATIPE) system to Sen. Pete Domenici, R-N.M., left, and Rep. Joe Skeen, R-N.M. In the center background is Systems Development and Engineering Center 5500 Director Dori Ellis.

now," Brad says. "A manufacturer in the US or Mexico starts the shipment going.

The manufacturer says, 'I've got something I need to ship into Mexico.' So he or she fills out some forms and sends them to a broker and then starts to make arrangements to contract a carrier to take the shipment across the border."

One after another, every party involved in the transaction is brought into the deal, each adding appropriate information and passing this on to the next stakeholder.

"So you've got all these people sending paperwork back and forth," Brad says. "With our system, we take everybody in the process — we know who they are because of the process map — and link them together across the Internet.

"With ATIPE, instead of this serial 'fill out a form, pitch it over the wall to the next guy' kind of thing, it's a collaborative process. Everybody fills out the forms together."

For the ATIPE system, Brad says, the team developed intelligent agents, little software "go-fers" smart enough to notify stakeholders whenever they need to get involved in a particular shipment. With the intelligent agents riding herd, every interested party gets near-simultaneous hands-on access to the part of the transaction relevant to them. And it's all done as a distributed system on the Internet, so the infrastructure costs are just about nil. The price of admission to the system, essentially, is the cost of a copy of a Web browser.

"Now they [the stakeholders] each have parts of the transaction they are responsible for," Brad says, "but there are also things in the information stream that they don't need to see about each other's business. As a result, we've designed the information system to be not only collaborative, but also secure — it's smart enough to respect and protect the proprietary information of each stakeholder.

"That's another key reason why Sandia is in this. We have all sorts of information-security expertise developed for our primary nuclear weapons mission."

## A total systems approach

According to Brad, ATIPE's beauty is that it takes a macro-oriented, total systems approach to the issue of commercial border traffic. And

because ATIPE expedites movement of "good guys" between Mexico and the US, the system by default enables both Mexican and US border officials to spend more time on their real mission: interdiction of contraband, including illegal drugs.

"Where our project is different from most border projects is that we didn't focus exclusively on the border crossing itself," Brad says. "We took the whole process from factory to factory; we took the process back several steps. If you focus only on the border, your options are fairly limited as to how you're going to expedite traffic movement. You're essentially focusing on just one little part of the process — basically two or three boxes out of 60 on the process map."

## Twice as much traffic

If the ATIPE system were adopted at the border, how effective would it be in actually speeding up movement of freight? An analysis performed by Science Applications International Corporation (SAIC) found that if half of the shipments crossing the US-Mexican border used these technologies, the average waiting time for all trucks could be cut in half.

The same analysis showed that with the Sandia technologies the ports of entry could handle twice as much traffic as the present maximum without having to add personnel or infrastructure.

According to Brad, the Alliance for Transportation Research (Sandia, Los Alamos National Laboratory, University of New Mexico, New Mexico State, and the New Mexico Highway Department) may seek additional funding to further refine the ATIPE system prior to any attempts to commercialize it. Even at its current stage of development, Brad says, shippers, carriers, brokers, and other affected parties are impressed with ATIPE's capabilities and eager to have it become available for widespread use.

And Sen. Domenici, who kicked off the whole effort, is clearly impressed with the outcome.

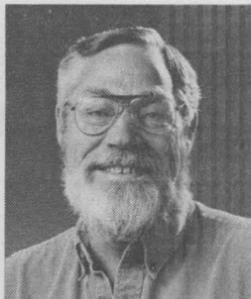
"This technology is truly a step in the right direction," he said at the Santa Teresa demonstration. "By using the ATIPE system at our international borders, we will not only be expediting the border crossing process, but also giving our customs officials an important tool in the drug interdiction efforts."



DUE PROCESS — Eunice Young (6614) explains the Maquiladora process map to Frank Fuentes of the US Customs Service. The map depicts all the steps involved in shipping goods between Maquila plants in the US and Mexico.

# Mileposts

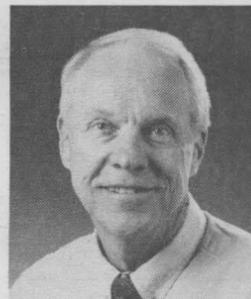
## June 1997



Gerald Ward  
15 12630



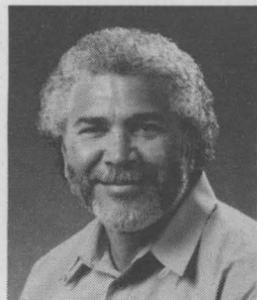
Regina Simpson  
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Paul Thompson  
30 5912



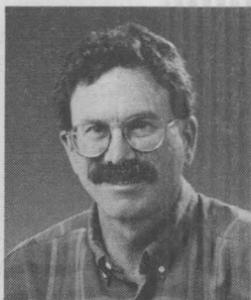
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20 9221



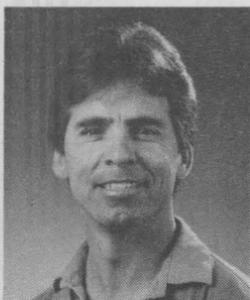
Lacey Learson  
25 10262



Raymond Berg  
25 2615



David Wenger  
20 9533



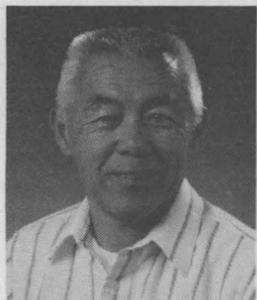
Matthew Sena  
15 2343



Johnny Ulibarri  
30 2417



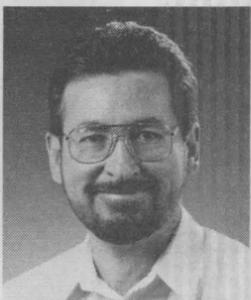
Paul Lemke  
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Kazuo Oishi  
35 2161



Joseph Allen  
30 7821



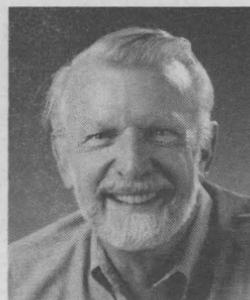
Steven Ulibarri  
15 3524



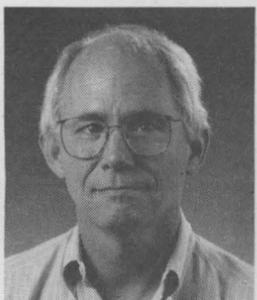
Gerry Mitchell  
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Merle Benson  
15 4619



Jeffrey Lawrence  
30 5335



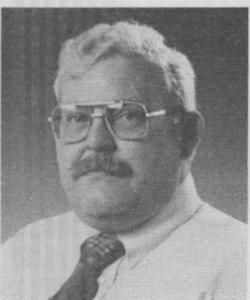
John Finger  
35 6111



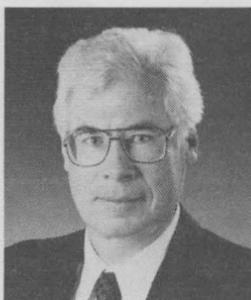
Johnny Duncan  
35 12303



Nancy Nesbitt  
25 14403



Marion Wilde  
20 5933



Tom Sanford  
15 9577



Chris Arana  
30 12850

## It's automatic: New System Management Server software enables near real-time profile of Labs' computer base

Attention, Windows 95 and Windows NT users: Don't sound the alarm when — not if — a new message appears on your computer screen sometime soon. You haven't caught a virus, and the millennium bug hasn't taken a bite out of your system.

The screen you'll see (if you haven't already) indicates that the Labs' new Microsoft Systems Management Server (SMS) software is being installed on your computer.

It's all automatic and is being installed initially on all Windows 95 and Windows NT computers connected to Sandia's Internal Restricted Network.

The SMS software enables system administrators to collect data about the computer hardware on the network. As such, says Jay Smith of Laboratories Computing Dept. 4911, SMS is "a powerful asset-management tool." Once the software is installed on a computer, system administrators can use SMS to keep running tabs on such things as: computer processor type (i.e., Pentium, 486, Pentium Pro), installed memory, hard disk size, cards installed, and more.

Jay notes that the SMS installation represents the first time at Sandia that computer software has gone automatically to a large number of computers without a human being installing it.

SMS is part of Sandia's plan for automatically keeping software up-to-date. The goal is to be able to install software Labs-wide automatically from a server on the network, so that a computer-support technician doesn't have to visit each computer.

Why? Jay explains: "Suppose it takes 15 minutes to install the latest version of Word or Excel on 8,000 computers at Sandia; by the time

we're done, we would have invested 2,000 hours on the process, the equivalent of one person working full-time for a year. We can put that time to better uses.

"We also need to be able to do updates more quickly than the weeks or months it takes individually, because we can't afford to have periods when part of the Labs may be creating memos or spreadsheets in file formats that are incompatible with the software being used by the rest of the Labs."

While remote software deployment is a goal, SMS will not be used for that purpose — currently another program called EDM, which will work in conjunction with SMS, does that.

### Common Operating Environment

The software to be automatically updated is that defined in the Common Operating Environment (COE). The COE is a corporate initiative that establishes a Labs-wide standard for 32-bit computers required to work with some of the network-based corporate business applications. The COE is aimed at ensuring that Sandia's personal computers (PCs, Macs, Unix) can work together without unnecessary barriers of incompatible software.

Because the SMS software gathers technical data about the Labs' installed computer base, Jay says, it will be an especially useful tool for making cost projections. If the Labs decides to upgrade to a new version of Office, for example, it will have the data to determine which computers will have to be upgraded or replaced to make the transition possible. And the information about the installed base

of computers will always be current: When the system is fully operational, SMS will update the Labs' Network Information System database about the configuration of computers every seven days.

Here's another way the Labs can tap into SMS's capabilities: The software can let computer-support technicians connect to a computer and troubleshoot it remotely. Although there are no immediate plans to use that capability, it can ultimately result in a much more efficient use of the Labs' Computer Support Unit of maintaining every desktop [computer] in the system," he says.

Jay acknowledges that some Sandians who have heard about the SMS process are concerned that it represents an invasion of the individual's workspace, or even an invasion of privacy. In response, Jay notes that SMS "has nothing to do with waste, fraud, and abuse."

SMS, he says, does not tell system administrators what files or applications are installed on a given computer.

"I can't use SMS to determine if you're running a home business from your computer," he says. "As a Sandian, it's still up to you to use it [your computer] in an appropriate, work-relevant manner. SMS does nothing to change that."

—Bill Murphy

### Recent Patents

James Nelson and Kenneth Gwinn (both on entrepreneurial leave), Daniel Luna, Donald McBride, and Larry Whinery (all 9116): Structurally Efficient Inflatable Protective Device.

# Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

## MISCELLANEOUS

BABY ITEMS, Cozy Cottage Bed, Graco swing, car seat, more. Smallwood, 839-7298, after 6 p.m..

CABLE-NELSON PIANO, w/bench, excellent condition, needs tuning, \$450 OBO; swing set, w/all pieces, heavy-duty, \$50. Hardison, 271-2838.

COUCH & LOVESEAT, mauve & white striped, \$250/both; oval glass-top coffee table, \$50. Campanozzi, 890-8253, ask for Kim.

BABY FURNITURE, light maple color, Simmons crib, changing table, high chair, all excellent condition. Luna, 881-6808.

OFFICE DESK, \$50; queen-size bookcase headboard, \$50; queen-size hardwood headboard; collectors' & kitchen items. Piatt, 293-1204.

DINING TABLE, Scandinavian-design hardwood, w/hidden leaf, 6 chairs, \$125. Walther, 294-6599, after 6 p.m.

MATCHING COUCH & RECLINER, light blue & beige, 3 yrs. old, excellent shape, \$300. Johns, 858-1403.

QUEEN-SIZE MATTRESS/BOX SPRING SET, \$50; Atari 400 (game/word processor) system, w/printer, \$40. Stevenson, 294-1197.

HOOVER UPRIGHT VACUUM, w/attachments, less than 2 yrs. old, \$40; authentic Scottish bagpipes, \$70. Peet, 294-1250.

CANON COLOR BUBBLEJET PRINTER, BJC-600, uses 4 ink cartridges, PC-compatible, software & manuals, mint condition, \$180. Kirby, 262-9577.

COFFEE TABLE & 2 END TABLES, almost new, used less than 2 months, \$100. Nagasubramanian, 292-0584, ask for Mani/Pushpa.

GE DISHWASHER, 2-cycle, approx. 15 yrs. old, works fine, \$50 OBO. Haschke, 299-0348.

PEARL DRUMS, 6-piece, all hardware, all Zildjian cymbals, like new, impeccably kept, \$2,000. Kottenstette, 450-3430.

SKI MACHINE, w/electronic readout, Precor commercial model, used infrequently, \$150 OBO. Miskowicz, 821-4149, call Tom after 6 p.m.

CHIPPER/SHREDDER, Junior Tomahawk Troy-built, 3-hp, \$300; cycle polisher/sander, \$45; old Westinghouse tube console radio, \$15. Steele, 892-0114.

FURNITURE, for 2-bdr. apt., half-price, all 1 yr. old; microwave, \$30; Pier 1 dining table, \$40; more. Yun, 291-6383.

'86 ISUZU TROOPER REAR BUMPER, w/good rubber sides, \$50; Dogloo, medium-size doghouse, w/swing door & carpet, \$50. Biggy, 821-4172.

SEWING MACHINE, Babylock Home Companion (not a serger), cabinet, seamstress chair, \$150. McKenzie, 275-4794, leave message.

TWO PAINTINGS, gold leaf, from Spain, \$250. Campbell, 294-1374.

OPTICAL FINISHING LAB EQUIPMENT, liquidation sale, perfect for new or established business, excellent condition, great prices. Avila, 275-9572.

PAIR OF LOTS, Sandia Memory Gardens, make offer. Burke, 1-719-275-6362, call collect after 8 p.m.

TWO FOLDING CHAIRS, fabric, wood arms, chromed metal frames, \$10 ea.; knee-high rubber boots, size 10, \$10. Freyermuth, 299-2053.

RATTAN DINING TABLE, antique yellow, w/6 cushioned chairs, 48-in. round or 72-in. oval w/leaves, \$150. Smith, 898-8429.

WROUGHT-IRON GATES, doors, & windows; baby high chair, stroller, & playpen. Sanchez, 873-4281.

STONEWARE, Pfaltzgraff, complete set, "Village" pattern, 8 place settings, w/serving pieces, matching stainless flatware & glassware. Seyfer, 292-0179.

SOUTHWEST SCENIC OIL PAINTING, by NM artist, "Shiprock," 6' x 3', serious inquiries only, \$5,000. Leon-Maestas, 299-6514.

MODEM, Teletport Platinum, 28.8k BPS, internet & fax, w/software for Macintosh, \$75. Holmes, 292-0898.

ELECTRIC DRYER, Whirlpool, heavy-duty, super-capacity, 6-cycle, infinite temperature, almond color, excellent condition, \$200. Reyes, 275-4908.

HAWAII ENTERTAINMENT BOOK, '97 issue, intact, \$25. Sanchez, 243-7016.

WOMANS' ROPER BOOTS, burgundy, new, size 7; electric lawn mower, console television, grandfather clock (best offer). Hoffman, 822-8244.

LA-Z-BOY RECLINER CHAIR, blue, great condition, original cost \$600, asking \$125; Craftsman 10-in. miter saw, \$100. Bear, 881-7128.

HUGE NEIGHBORHOOD GARAGE SALE, 8 a.m., Sat. June 21, east of Tramway, between Copper & Lomas, follow signs. Fogelson.

RUMMAGE SALE, Sat. only, June 21, 10 a.m.-3 p.m., 3400 Aztec NE (near Carlisle/Candalaria). Babb, 865-6843.

RABBIT/BIRD CAGE, 2' x 3', w/tray, \$25; chain-link fencing, 30 ft., w/6 posts, gate, \$30 OBO. Brethauer, 332-0824.

COUCH, CHAIR, & OTTOMAN, less than 1 yr. old, must sell, \$1,300 new, asking \$500 OBO. Sartor, 858-2554.

COMPUTER/RIMS, IBM PS/1 Consultant, 386, good starter for kids, \$300; rims, Prime 5 star, excellent condition, \$300. Montoya, 839-0758.

KING-SIZE OAK HEADBOARD, \$10; couch, \$35; recliner, \$10. Davis, 293-7457.

THIRTIES DUNCAN PHYFE DINING ROOM SET, drop-leaf table, 38" x 55", two leaves, 4 roseback chairs, upholstered seats, \$600 OBO. Mitchell, 294-2973.

DOG, young, spayed, female, house-trained, English setter/border collie cross, good disposition, free to good home. Casbourne, 268-3942.

CHRYSLER AM/FM CASSETTE CAR RADIO, \$75; P215/75R-15 studded snow tires, low miles, pair \$75. Bencoe, 294-3768.

WASHER & DRYER, Kenmore, \$50 ea.; Sharp carousel microwave oven, \$40; two solid-maple microwave stands. Shrouf, 821-0765.

MAP FILE, 5-drawer, \$50; Wurlitzer electronic organ, w/bench, \$195; ceramic molds; large/medium-sized planter pots, \$20-\$40. Sparks, 266-5060.

GARAGE SALE, June 21, 9 a.m.-1 p.m., furniture, household & more, 1220 Setter Drive NE. Eager, 299-6874.

ELECTRIC WHEELCHAIR, Amigo J9 (top of the line, cost \$3,500), like new, asking \$1,700. Larson, 294-6705.

WHEELS, 14-in., 6-hole, w/P195/75R14 tires, fits many compact trucks, \$8 ea. or \$20 for three. Hueter, 299-7263, leave message.

GE REFRIGERATOR, side-by-side, water & ice, \$350; Tappan double-oven stove, w/exhaust fan, \$250. Santana, 294-0536.

NORDICTRACK, cross-country ski machine, Sequoia model, \$210. Spires, 275-3655.

GPS RECEIVER, Magellan Trail Blazer XL, w/instructional video, owner's manual, carrying case, excellent condition, \$150. Gurule, 298-5768.

KENMORE REFRIGERATOR, 2 yrs. old, white, top freezer, 18 cu. ft., \$450; Maytag washer & gas dryer, \$350/pair. Painton, 237-1579.

EXERCISE MACHINES, top of the line: cantalver stepper, \$145; exercycle w/calorie counter, \$95. John, 345-4006.

YARD SALE, dresser, desk, pictures, kitchenware, clothing, small TV/radio, June 27 (2-7 p.m.) & June 28 (10 a.m.-5 p.m.). Kent, 254-1033.

PURSES, original Dooney & Bourke, new, from Dooney factory in Connecticut, discounted prices. Sumruld, 877-0879.

WASHER/DRYER, excellent condition, \$200; wedding dress, size 8, silk, off-the-shoulder, \$250. Kincaid, 296-6014.

OAK SOFA, from Autumn Wood, 80" x 34", excellent condition, cost \$1,000, asking \$450. Yelton, 281-2893.

RUMMAGE SALE, multi-family, Saturday, June 21, 12249 Victoria Falls NE (NW of Tramway/Candalaria). Daniels, 237-9631.

GERRY BABY MONITOR, Graco wind-up swing w/cradle, musical mobile, Gerry walker, Sesame Street play gym. Boissiere, 291-0159.

## TRANSPORTATION

'84 CHEV. BONAVENTURE VAN, 8-passenger, gold/tan, 136K miles, runs great, rebuilt transmission, most records. Cox, 296-1337.

'96 FORD RANGER XLT, supercab, AM/FM cassette, 5-sp., 4.0L, AC, two-tone paint, 12K miles, \$14,000. Manzanares, 836-4697.

'85 TOYOTA COROLLA, approx. 88K miles, new tires & brakes, excellent condition, \$2,500. McConnell, 883-6073.

'90 JEEP GRAND WAGONEER, 50K miles, great condition, warranty, below book, \$10,500. Rohwer, 831-9426.

'91 NISSAN MAXIMA SE, 5-sp., loaded, excellent condition, \$9,750. Marquez, 294-9014, ask for Chris.

'91 LEXUS ES250, loaded, ABS, AC, CD, leather, moonroof, almond beige, all records, excellent condition, \$11,250. Nickell, 296-1962.

'85 BUICK PARK AVENUE, body great condition, needs engine repair, willing to negotiate. Elder, 828-2608.

'91 ISUZU RODEO LS, 4x4, 5-sp., ski carrier, tow bar, Pestal phone, 95K miles, \$10,250. Emery, 856-6950.

**DEADLINE: Friday noon before week of publication unless changed by holiday. MAIL to Dept. 12640, MS 0165, FAX to 844-0645, or bring to Bldg. 811 lobby. You may also send ads by e-mail to Nancy Campanozzi (nrcampa@sandia.gov). Call Nancy at 844-7522 with questions. Because of space constraints, ads will be printed on a first-come basis.**

## Ad Rules

1. Limit 18 words, including last name and home phone (We will edit longer ads).
2. Include organization and full name with the ad submission.
3. No phone-ins.
4. Use 8 1/2- by 11-inch paper.
5. Type or print ad; use accepted abbreviations.
6. One ad per issue.
7. We will not run the same ad more than twice.
8. No "for rent" ads except for employees on temporary assignment.
9. No commercial ads.
10. For active and retired Sandians and DOE employees.
11. Housing listed for sale is available without regard to race, creed, color, or national origin.
12. "Work Wanted" ads limited to student-aged children of employees.

'88 JEEP CHEROKEE LAREDO, 4x4, 150K miles, power everything, excellent condition, new tires, alarm, \$5,800 OBO. Matz, 332-3359.

'84 BUICK REGAL, 4-dr., excellent shape, runs great, high mileage, rebuilt everything, \$2,500. Stone, 298-3341.

'91 HONDA CIVIC LX SEDAN, 5-sp., power everything, super clean, single owner, 97K miles, \$6,500. Wood, 881-2395.

'89 TOYOTA PICKUP, metallic blue w/matching Snugtop shell, 1-yr.-old tires, shocks, & timing belt, 113K miles, \$2,600. Giersch, 299-9512.

'75 CHEV. NOVA, 63,201 miles, recent tuneup, 2-dr., \$500 OBO. Denish, 256-1559.

'79 MERCEDES 240D, looks great, runs great, \$1,800 OBO. Brooks, 255-7551.

'89 JEEP WRANGLER, 4.2L, over \$10,800 invested in parts/accessories, asking \$13,500 OBO. Pierce, 239-5533.

'89 MAZDA 323, 2-dr., 4-sp., 128K miles, AM/FM cassette, red w/black interior, good condition, \$2,750. Rue, 891-3994.

'88 PONTIAC GRAND AM, AT, AC, white, good condition, good tires, \$2,900. Russell, 294-0229.

'94 FORD EXPLORER, Eddie Bauer, 4x4, fully loaded, excellent condition, 41K miles, towing pkg., ABS, \$17,500. Smith, 275-1666.

'92 MAZDA MX-3, excellent condition, 5-sp., 35-mpg, AC, cruise, AM/FM cassette, \$7,250 OBO. Perry, 237-2501.

'95 MERCURY TRACER, low mileage, PS, PB, PW, PL, cruise, tilt, tint, AM/FM cassette, excellent shape, \$11,000. Barraza, 856-7864.

'89 FORD CLUB WAGON, PS, brakes (new), windows, doors, & AC, privacy glass, side-door handicap lift, \$6,500. Ashworth, 281-2824.

'90 FORD F150, 4x4, 4-sp., 4.9L EFI, dual tanks, trailer hook-up, solid on/off road, \$7,500 OBO. Sauer, 865-7680.

'95 CHEV. ASTRO VAN, Luxury Touring, loaded, rear air, excellent, original owner, \$16,900. Munson, 822-1497.

'75 INTERNATIONAL TRAVELLER, 4x4, AT, PS, tilt, cruise, AC, 107K original miles, all records, \$3,250 OBO. Kureczko, 281-8206.

'90 FORD RANGER XLT, 4x4, supercab, AT, \$5,900; '92 Layton travel trailer, 16-ft., \$3,900. Hilborn, 220-8530 or 220-2400.

'86 BMW 325e, 4-dr., very low miles, loaded, leather, tip-top shape, must see, \$8,000. Nickell, 296-1962.

'96 JEEP CHEROKEE SPORT, 4-dr., 5-sp., 4.0L engine, emerald green, cruise, PW, PL, like new, 20K miles. Bergeron, 292-0363.

'95 NISSAN ALTIMA, 4-cyl., manual transmission, approx. 39,597 miles, PW, stereo/tape player, may be seen at credit union. SLFCU, 237-7382, ask for Lisa.

'90 DODGE GRAND CARAVAN SE, great condition, AC, PS, AM/FM cassette, PL, PW, cruise, 77K miles, \$6,400 OBO. Herrera, 884-4925 or 881-1600.

'95 MERCURY TRACER, low miles, very nice, 4-dr., PW, PL, cruise, tilt, AM/FM cassette, AT, \$11,000. Barraza, 856-7864.

'71 BUICK SKYLARK CUSTOM, collector car, all-original, records, 39K orig. miles, \$5,500 OBO. German, 294-4540.

'70 BUICK LESABRE, 2-dr., 350, AC, 35K original miles, great condition, includes spare parts car, \$3,900 OBO. Zarrella, 831-1981.

## RECREATIONAL

WOMAN'S MOUNTAIN BIKE, excellent condition, estimated mileage less than 40 miles, original price \$370, asking \$170. Forrest, 275-3797.

CAB-OVER CAMPER, 9-1/2-ft., fridge/freezer, stove, toilet, new carpet, 4 new hydraulic jacks, good condition, \$1,000. Schlavin, 299-6592.

'93 YAMAHA FZR 600, new wide tires, low miles, helmet & extras, \$4,100 OBO. Merewether, 898-6089.

GIRL'S BICYCLE, 24-in. Huffly, good condition, \$30. Duda, 292-2015.

TWO-WOMAN CREW, available for day sailer/cruiser, trade lessons for boat time; 2 sailboards. Zeuch, 296-4969.

1923 FORD T-BUCKET REPLICA, 454 Chev. engine, turbo 40 transmission, Chrysler 8 3/4 Positrac, much more. Daniels, 883-2828.

BOAT, fish & ski, tilt trailer, trolling motor, new tires/upholstery, gas tank, vests, skis, oars, complete, \$700. Dempsey, 281-9101.

BICYCLE, Club Fuji, 14-sp., 20-1/2-in. frame, red/white, perfect. Kesti, 821-9208.

MAN'S BICYCLE, Centurion, 12-sp., cycle computer, \$65; woman's Schwinn, 10-sp., hardly used, new \$200, asking \$100. Barnette, 861-2451.

'74 TRI-HULL BOAT, 16-ft., 115-hp Evinrude outboard, w/trailer & boat cover, \$3,000. Luikens, 271-0019.

'96 HARLEY 883, black, 2-seater, 500 miles, \$7,500 OBO. Madalena, 834-7246.

'89 BAYLINER CAPRI BOAT, 19-ft., 125-hp, needs hydraulics work, must sacrifice, \$4,000 firm. Sanchez, 293-6335.

BOAT, 17' 7" semi-vee, 120-hp Mercurier I/O, w/Dilly EZ-load trailer, \$3,300 OBO. Shaut, 299-8569.

FIFTH ANNUAL FISH FEST, in Eagle Nest, NM, Sept. 20-28, tickets are \$15 per person for all 9 days. Martin, 296-8154.

180 XLS DIRT BIKE, street-legal, excellent condition, low mileage, garaged, original owner, no abuse. Fisher, 881-8072 or 881-8611.

TWO ROUNDTRIP TICKETS, anywhere Southwest flies, thru March '98, \$275 for one or \$525 for both. Jackits, 866-7383.

'90 HONDA MOTORCYCLE, Model NT650 "Hawk," Kerker headers & pipe, excellent condition, \$2,300. Johnston, 332-3840.

SAILBOAT, 22-ft. Venture, \$3,000 OBO; propellers, 20-22 pitch; '96 Blazer/Jimmy bedliner; box trailer; misc. Trollering, 265-1615.

SPECIALIZED "ALLENZ" ROAD BIKE, 54cm carbon-fiber frame, pump, helmet, cycle computer, excellent condition, \$450. Benecke, 286-2154.

'87 SHASTA CABOVER CAMPER, 2-way fridge/freezer, hot water, stove, heater, bath, 2 queen beds, \$4,000. McAllister, 281-5188.

'82 ITASCA MOTORHOME, Class A, 23-ft., loaded, low mileage, recent interior, \$10,500. Perkins, 899-8766.

FOUR AMERICA WEST CERTIFICATES, \$25 ea., \$80/all; 2 round-trip tickets, transferable, \$300 ea., discounted to \$250 ea., good until Dec. 28, 1997. Fries, 260-8230.

'77 SEA RAY, 21-ft., 235-hp I/O, Bennett trim tabs, Bimini top, dual bat., cover, tandem trailer, \$5,000. Stayton, 898-2460.

'93 DIAMONDBACK MOUNTAIN BIKE (Sorrento), 20-in. frame, Manitou "3" shock, new seat, good condition, \$300. Donald, 332-1446.

2-BDR. MOBILE HOME, 16' x 60', 2 baths, adult park near base, excellent condition. Rosenberg, 296-1346.

3-BDR. HOME, 1,800 sq. ft., 2 baths, LR w/kiva & beams, MBR w/kiva, 2-car garage, heated studio, 14345 Marquette NE, \$164,900. Heinze, 275-2244 (a.m.) or 293-6839 (p.m.).

3-BDR. HOME, 1-3/4 baths, 1,950 sq. ft., SE, fireplace, woodstove, 2-car garage, redwood deck, Juan Tabo/Central, \$132,000. Larkin, 881-8906.

2-BDR. MOBILE HOME, '87 Redman, 2 full baths, appliances, awning, shed, new plumbing, excellent condition, close KAFB. Zamora, 294-3893.

4-BDR. MOSSMAN HOME, 2,140 sq. ft., 2 baths, large LR, den w/fireplace, landscaped, automatic sprinkler, RV access, \$124,900. Duffield, 888-3107.

4-BDR. HOME, study, 2-1/2 baths, 3-car garage, 2,350 sq. ft., security system, landscaped, closing cost incentive, \$218,900. Davidson, 821-0579.

3-BDR. TOWNHOME, 2,000+ sq. ft., 2-1/2 baths, 2-car garage, wrought-iron security, bricked patio w/terrace landscape, \$152,000 (BMA). Jackson, 881-8011.

2 BDR. CONDO, Comanche/Wyoming, 1-1/2 baths, 1-car garage, professionally remodeled, \$75,000. Gutierrez, 293-2260.

TWO ONE-ACRE LOTS, electricity, water available, Arrow Head Lake Estates, Regina, N.M., ideal for cabin. Upchurch, 296-8591.

3-BDR. HOME, 2-story, Sandia Park, 2,300 sq. ft., 2-1/2 baths, 2-car garage, fenced backyard, 2.25 acres, \$198,950. Salazar, 899-0483.

4-BDR. PATIO HOME, 3 baths, upstairs/downstairs patios, landscaped, security system, double garage, east of Tramway/Indian School, \$159,000. Kaufmann, 292-9249.

1/2-ACRE CORNER BUILDING LOT, Oak Ridge, Tenn., Westwood subdivision, listed at \$48,000, must sell at \$40,500. Feng, 275-6639.

## WANTED

MAN'S ID BRACELET, old-style, heavy silver, engraving no problem. Underhill, 294-5774, after 6 p.m.

INVERSION BOOTS, or complete set-up. Schaub, 865-8807.

COPY of Microsoft Office 7. Sarkis, 266-2790.

BOOKS ON CASSETTE, we have several cassettes, would like to trade. Towne, 867-8868.

STEREO MICROSCOPE, low-to-medium power (10X to 40X). Rinehart, 237-1326.

2-4 BDR. HOUSE RENTAL NEEDED for visiting Italian scientist & family, June 28 through Aug. 9, responsible. Gemmell, 292-5910.

SAILBOAT, to rent, small daysailer for beginner. Drotning, 821-9598.

HOUSEMATE, to share home, within walking distance of Nob Hill & UNM, nonsmoker, \$350, includes utilities. Larson, 232-7044.

CHILDREN'S CHRISTIAN/BIBLE VIDEOS, and/or audio; "Adventures in Odyssey" videos or audio cassettes. Sanchez, 873-2058.

FILE CABINET, 11" or 14", 4 or 5 drawers. Moss, 298-2643.

SMALLER TRUCK, good working order, reasonably priced. Phillips, 262-0987.

HOUSEMATE, male/female, share 1,750-sq.-ft. Taylor Ranch house, nonsmoker, \$400 plus half of utilities. De Marquis, 899-4277.

PART-TIME SITTER, for older gentleman, near Louisiana & Montgomery, ideal for older teen, nonsmoker, \$5/hour. Jennings, 878-0828.

AIRSTREAM TRAILER, 22-ft. or less w/single axle, need older model, reasonable price. Harmon, 856-1805.

MOVING BOXES, for moving belongings from apartment to house, preferably low-cost or free. Amatucci, 294-4657.

HOUSEMATE, nonsmoking, 1,800-sq.-ft., home, \$300 plus 1/3 utilities. Griego, 866-6963, call for appointment, Sat. evenings or Sundays ideal.

HOUSEMATE, to share 3-bdr. townhouse, on westside, female, nonsmoker, \$200/mo. w/utilities. Nieto, 831-6122.

## REAL ESTATE

3.83 ACRE LOT, Ranchos De Placitas subdivision, 360-degree views of Sandias, excellent water system & underground electricity. Rogers, 867-3388.

3-BDR. ALL BRICK MOSSMAN HOME, near Arroyo del Oso golf course, 2,100 sq. ft., den w/fireplace, 1-3/4 baths, \$172,500. Clevenger, 888-0209.

2-BDR. CONDO, close to base/hospitals, 2 baths, all appliances, covered parking, on-site manager, gated area, \$69,000. Frytz, 294-7322.

4-BDR. HOME, custom, new, 2 baths, 2,066 sq. ft., 2-1/2 acre irr/alfalfa, master bath w/jacuzzi, barn & storage shed, horses okay. Baca, 865-3717.

## WORK WANTED

YARD WORK, weeding, pruning, hedge trimming. Sparks, pager 222-5966 or 884-5644.

STUDENT will wash, wax, vacuum, & thoroughly clean interior/exterior autos, trucks, other vehicles. Jackson, 255-2549, ask for Jennifer.

## Sandia News Briefs

### Robert Waters to study weapons sites in the former Soviet Union

Robert Waters of Nuclear Energy Technology Center 6400 has accepted a temporary assignment with the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria. He will be the technical co-leader of a project evaluating environmental risks resulting from nuclear weapons production at Tomsk and Krasnoyarsk, Russia.

The project is designed to assess the long-term health risks to populations surrounding these formerly secret installations in central Siberia from routine and accidental releases of radioactivity. The project will also evaluate the effectiveness of alternative concepts for remediation. IIASA is a nongovernmental research organization that conducts scientific studies on environmental, economic, technical, and social issues. Waters currently leads projects that evaluate disposal options for DOE's low-level and mixed low-level wastes.

### Sandians win DOE Meritorious Service Medals

Sandians David Caskey, Donna McConnell, and Terri Olascoaga (all 5824) have been presented DOE's Meritorious Service Award as members of the Task Force on Nuclear Material Protection, Control & Accounting for Russia, the Newly Independent States, and the Baltics. The award was presented by Mike McClary, Director of the Russia/NIS Nuclear Security Task Force. The three Sandians were among 27 task force members from DOE, national laboratories, and DOE contractors to receive the award.

The award citation reads, in part: "The efforts of the task force have had a major impact on the improvement of the security of nuclear materials in the countries of the former Soviet Union. This record of success serves as a major contribution to international security and to the national security of the United States." During the presentation, each recipient was individually cited and given a plaque, a letter of commendation, and a DOE Meritorious Service Medal.

Send potential News Briefs to Lab News, Dept. 12640, MS 0165, fax 844-0645.

## PRSA honors Sandia Perspectives, Lab News, other activities

Two Sandia publications have won first place "El Conquistador" awards in the Public Relations Society of America, New Mexico Chapter 1996 awards competition.

*Sandia Perspectives*, a 28-page Sandia "annual report" for 1996, won first place in the Annual Reports, Government category. The new photo-rich publication is intended to provide yearly, comprehensive information about Sandia's contributions to national security to stakeholders in government, industry, and academia. Team members are Bruce Fetzer, Julie Clausen, Linda Doran (all 12680), Toby Dickey (12620), and Randy Montoya (12640).

The *Sandia Lab News* won first place in the Internal Newsletters, Government category. Three *Lab News* issues were submitted for judging: Feb. 16, 1996 (Labs Accomplishments issue); Nov. 22, 1996; and Dec. 6, 1996. Team members come from throughout Dept. 12640 and (in California) Dept. 8802.

Other Sandia entries recognized include:

- Robotic Manufacturing Science and Engineering Laboratory (RMSEL) dedication ceremony, second place, Special Events and Observances, Government. Team members included Julie Clausen, Bruce Fetzer, Mike Lanigan (12680), Carl Hamberg (9601), Bobbi Burpo, Deborah Payne (both 12670), Leslie Rettinger, Laurie Bergeron (both 9600), Chris Miller (12640), and Randy Montoya.

- *Inside Sandia*, honorable mention, External Newsletter, Government. Team members include

Julie Clausen, Toby Dickey, Tammy Locke (12620), and Mark Poulsen (former Sandian).

- 1996 Week of Caring, Martineztown House of Neighborly Services, honorable mention, Special Events and Observances, Government. The 1996 Week of Caring Steering Committee and many Sandia volunteers were involved.

Members of PRSA's chapter in Tulsa, Okla., judged the New Mexico entries based on each publication's or event's stated objectives, creativity and judgment applied in selecting strategies and techniques, effective use of budget, quality of material produced, relationship to audience, general impact, and technical quality.

## Fun & Games

**Volleyball** — The Carrie Tingley Hospital Foundation is gearing up for the third annual Mudd Volleyball Tournament scheduled for Saturday, July 19, in Albuquerque's South Valley, ¾-mile north of Rio Bravo on Broadway SE. More than 250 teams are expected to get down and dirty to play volleyball in a foot of mud and raise money for the special-needs children of Carrie Tingley Hospital. The 12-member teams must have eight players on the court at all times, four of whom must be female. All players must be 18

## Coronado Club

June 19, 26 — Thursday bingo night. Card sales and a la carte buffet start at 5 p.m., early birds' bingo at 6:45 p.m. Pool open to 9 p.m.

June 27 — Kids' bingo. Free hot dog and soft drink with \$2.50 bingo card. Bingo starts at 7 p.m.; buffet open 5-8 p.m.

June 29 — Sunday brunch buffet, 10 a.m.-1 p.m. \$7.95 all-you-can-eat buffet. Kids 3-12, \$1, under 3 free. Music by Swingshift, 1-4 p.m.

July 3, 10, 24 — Thursday bingo night. Card sales and a la carte buffet start at 5 p.m., early birds' bingo at 6:45 p.m. Pool open to 9 p.m.

July 4 — Independence Day celebration; buffet open at 11 a.m. Music by Isleta Poorboys, 2-6 p.m. Pool open to 9 p.m.

## Sandia Night at The Beach June 21

On Saturday, June 21, 7:30 p.m.-midnight, Sandia and DOE employees and their families and friends can slip, surf, slide, and float to their hearts' content during the second annual SERP-sponsored "Sandia Night" at The Beach Waterpark. Tickets can be purchased at the SERP office and are \$3 per person for the evening in advance or \$5 at the door.

The Beach Waterpark is located at the corner of Montgomery/Montano and I-25. The Beach features a variety of waterslides (three new ones), a giant wave pool, a "lazy river" that encircles the park, regulation-sized beach volleyball courts, and a kiddie pool with a number of pint-sized attractions. Tubes, normally available as a rental item, will be available to use free of charge. Lifeguards will be on duty, and the facility is handicapped-accessible. This year, The Beach will allow outside food and drinks into the park, and a variety of concession stands will feature pizza, sandwiches, fries, soft drinks, and ice cream. Call SERP at 844-8486 for more information.

or older to play. The fund-raising goal for this event is \$75,000. Players raising sponsorship money are eligible for prizes, including two free round-trip airline tickets anywhere Southwest Airlines flies. The basic registration fee is \$220 for a team of 12. Registration plus 12 shirts is \$265 per team. Entry forms can be picked up at the SERP office. For more information about how to enter your team, call Elizabeth Madden at 243-6626. Call early because this event sold out last year.

## Sympathy

To David (5838) and Phillip (2645) Skogmo on the death of their father in Florida, May 11.

To Bob Graham (5838) on the death of his mother-in-law in Kansas, May 12.

To Theresa Broyles (1554) on the death of her mother, Marion Hankinson, in Johnstown, Penn., May 21.

## Retiree deaths

Betty Gray (68) .....3531 .....April 23  
William Pawley (73) .....3155 .....April 24  
Harold Widdows (74) .....1552 .....April 25  
Frank Dain (79) .....1124 .....April 26  
John Russell .....7141 .....April 27

Organization numbers indicate retirees' positions at the time of retirement and may not correspond to present-day organizations.

## Honoring Professional Excellence process set up for nationally recognized Sandians

Honoring Professional Excellence is a new recognition process for Sandia employees who have received national or international awards. A committee of division representatives chaired by Nina Chapman, HR Customer Service Manager to Division 1000, developed the recognition criteria and process to honor those who have excelled and been recognized nationally or internationally for their accomplishments.

The recognition process will take place yearly at the Fall Leadership Forum. The vice presidents' administrative assistants will coordinate the submission of nominations for their respective divisions during June for the time period August 1996 through July 1997.

Bob Eagan, Division 1000 VP, has championed the process to "recognize those employees who have made outstanding contributions

and bring national or international recognition to Sandia."

"The Professional Excellence Recognition Process" will honor Sandia employees who have received major external national or international recognition for research, engineering, or professional contributions, such as:

- Specific professional or technical achievement
  - Breakthrough technology
  - Unique expertise or achievement
  - History of exceptional performance in a professional field (outstanding contributions)
  - Serving as a president of a national or international organization of high value to Sandia
  - Service on a "US Presidential committee"
- If you have questions, call Nina at 845-8520.