‘Active Denial System’ could boost security of DOE nuclear assets

Millimeter-wave device puts the ‘heat’ on adversaries

By Michael Padilla

A multi-organizational team has developed technology that can be used to put the “heat” on adversaries and help protect DOE nuclear assets.

The DOE Office of Security and Safety Performance Assurance (SSA) is exploring the potential to use directed energy weapons technology sponsored by the Department of Defense (DoD), named Active Denial Technology (ADT), to help protect DOE nuclear assets.

SSA is sponsoring Sandia to investigate how this technology can be used on adversaries by developing a new small-sized Active Denial System (ADS) to meet the unique and rapidly evolving security needs of DOE. To help solve the many technical issues associated with this challenge, Sandia has partnered with Raytheon and the Air Force Research Laboratory (AFRL), because both organizations have significant experience with earlier ADS system developments.

ADS systems are a new class of nonlethal weaponry using 95 GHz-millimeter-wave directed energy . . . capable of rapidly heating a person’s skin to achieve a pain threshold . . . very effective at repelling people, without burning the skin or causing other secondary effects.

ADS systems are a new class of nonlethal weaponry using 95 GHz-millimeter-wave directed energy. This technology is capable of rapidly heating a person’s skin to achieve a pain threshold that has been demonstrated by AFRL human subject testing to be very effective at repelling people, without burning the skin or causing other secondary effects.

In the mid 1990s, the Air Force funded development of an ADT system demonstrator that was led by AFRL and built by Raytheon in partnership with Communications & Power Inc. (CPI) and Malibu Research. The success of this demonstration system has resulted in several ongoing DoD-sponsored projects, such as the Joint

(Continued on page 4)

NONLETHAL WEAPONRY — Sandia researchers Willy Morse and James Pacheco fine-tune the small-sized Active Denial System. (Photo by Randy Montoya)

Sandia tests rad-hard components of Deep Impact comet mission

By Neal Singer

The Deep Impact spacecraft expected to intersect Comet Tempel 1 on July 4 had some of its guidance system components tested at Sandia’s Gamma Irradiation Facility to be sure they were sufficiently radiation-hardened to survive the journey through space. The rocket is expected to release a wine-cask-sized impactor and transmit data back to Earth on the results of the collision.

The purpose of the space mission is twofold: to expose to human instruments the inner materials of the comet, believed to be in the same unaltered state as when the solar system originally formed; and to gain information to protect Earth by learning exactly what happens when a potentially deadly space voyager meets with a high-speed impact.

“We provided the gamma radiation environment to test samples of the rocket’s electronic parts before and after being hardened,” says Sandia researcher Don Berry (6782).

NASA image by Pat Rawlings

Sandia’s Gamma Irradiation Facility keeps rods of cobalt-60 shielded beneath 18 feet of water.

Raised by an electrically driven elevator into a dry, empty room with walls six feet thick, the radioactive material ionizes the parts placed there to be tested.

After a pre-determined exposure time, the rods are lowered beneath the water.

The parts then can be removed and tested to see how well their functionality survived the powerful irradiation.

The procedure is called a “radiation lot acceptance test,” said Albuquerque-based SAIC scientist Ed Draper, who delivered the components to the Sandia facility. “Parts of a lot are tested and if they pass, then — since there’s little variation in the manufacturing process — the entire lot is deemed acceptable.”

While Don describes the Sandia irradiation facility as “a fairly humble place,” Draper holds a different opinion. (The Science Application International Corporation, headquartered in San Diego, was awarded a contract from Northrop Grumman Guidance Systems to test the parts.) “Sandia’s Gamma Irradiation Facility is by far the best for that type of work I’ve come across in the past decade. Not only is the facility marvelous but the people are first-rate. The place does everything we need. They’re accommodating in terms of scheduling, they’re consummate professionals, they’re always willing to help out, and they make life easy for us. You should be proud of their work.”

The principal mission of the Gamma Irradiation Facility is to ensure that nuclear weapons components can survive hostile environments.

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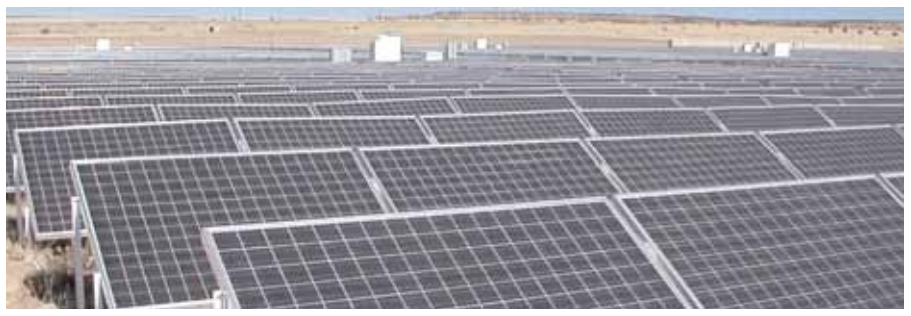


Sandia and Tucson Electric Power document utility’s PV experience

By Chris Burroughs

Tucson Electric Power Company (TEP) and Sandia have joined forces to document the utility’s four-year experience with photovoltaics. A recently released report — prepared by the Labs and TEP using data provided by the utility — offers a wealth of knowledge to support the Department of Energy Photovoltaic (PV) systems program.

Springerville photovoltaic plant is one of largest in the world

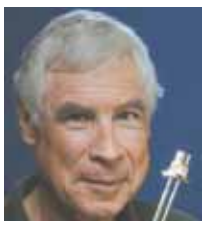
Labs researcher Larry Moore (6216), together with TEP, studied data acquired over the past four years from a field of 3.6MW of crystalline silicon PV collector systems located at the TEP Springerville Generating Station Solar System near the New Mexico/Arizona border. Using these data, Larry and TEP compiled the report that provides analyses of the operations to better define PV costs, maintenance needs, and necessary improvements. The system also includes 1 MW of thin film arrays.

“This work is especially timely as Congress debates a national energy bill that may focus more electrical generation on solar and other alternative resources,” Larry says.

TEP is the second-largest investor-owned utility in Arizona, providing

(Continued on page 4)

Combustion Research Facility marks 25 years of hot research. *Story on* ***page 3.***



Sandia scientist Tom Sanford honored for groundbreaking work on Z. *Story on* ***page 6.***

Cowboy Archie Gibson rides herd on Sandia’s computer “livestock.” *Story on* ***page 7.***

What's what

There are a couple of large meeting rooms in our building, so we have a group or groups here almost every day. Sometimes there's food at these meetings, and leftovers – if there are any – are often brought out and offered up at our reception area (dubbed by one of our more colorful receptionists of the past "the trough").

Such a meeting was held recently to welcome summer intern students, who munched Dion's pizza and salad while the marvels and mysteries of Sandia were explained to them. After they were filled with pepperoni and tomato sauce, sausage and romaine lettuce, and, of course, awe at the marvels and mysteries of their summer employer, they left – and left their leftovers on "the trough."

And those leftovers? Croutons. Not a shred of lettuce or spot of tomato sauce; not even the aroma of sausage or pepperoni. Just croutons.

So, was it a rapt audience? A hungry one? Probably just students in their natural habitat: lectures to sit through and pizza to eat.

* * *

On the way to and from work, I drive most days through a very nice section of town whose residents walk their dogs, jog, bike, chat in the pocket parks, and otherwise carry on as you would expect people to carry on in an upscale neighborhood.

Driving along one day recently, mind idling to the strains of Lee Morgan or Horace Silver or Clifford Brown on Sirius Channel 72, I wondered what an alien scout on Earth to study Americans would report about this well-kept and well-lived-in neighborhood. Something like this, maybe:

"These creatures have no naturally-occuring protective features, such as poisonous spikes or leveraged appendages or predatory-type teeth of the variety that many of their lower-order fellow beings use to protect themselves and procure food. Also, they intermingle uneventfully, for the most part, indicating that their social organization is relatively high.

"Oddly, though, many of them seem to be afraid, although I cannot determine the reason for those fears. They run about in all directions much of the time, especially in the early and later parts of the day. I have seen no evidence of a threat, but there must be one because this strenuous physical exertion is obviously stressful for them: While they are so engaged, their facial expressions (this species is very expressive) show anguish, and sometimes outright pain. This is puzzling behavior. Especially puzzling since while so many seem so agitated and in flight, many others right in their midst are engaging quietly in the social intermingling noted above.

"Another puzzling aspect of their existence is that although they appear to be among the more favored of their species – their dwellings are spacious and handsomely appointed, their vehicles are large and well made, their clothing appears to be of fine quality – many of them seem to have to walk or pedal their way wherever they go.

"All in all, a strange species, and, I think, one requiring more observation."

– Howard Kercheval (844-7842, MS 0165, hckerch@sandia.gov)

Safety Fair is June 29

The Sandia Safety Fair on June 29 features an all-day line-up of special presentations, provocative speakers, fun and informative displays — all oriented around the theme of safety at home and on the job.

Presentations

Bldg. 825 (Schiff Auditorium)

8 am — Steve Sink, APD, "Neighborhood Watch and Personal Safety"
9:30 am — Sandia VPs Les Shephard & Frank Figueroa, keynote speakers
10 am — Reggie Tibbetts, Sandia Security, "Preventing Identity Theft"
11 am — Dr. Cazzola, Sandia Medical, "Lifestyle Changes"
11:30 am — UNM Poison Control Center
Noon — Ralph Wrons, "Bicycle Safety"
12:30 pm — Ron O'Hara, Sandia Safety Engineer, "Fireworks Safety"
1 pm — AAA Travel, "Travel Safety"
1:30 pm — Griffin & Associates, "Ditch/Water Safety"
2 pm – Dr. McCarthy, Sandia Medical, "Heart Defibrillators"
2:30 pm — Carolina Geisseler, Sandia Medical, "Substance Abuse Awareness: Recognizing Signs and Symptoms"
3 pm — Christina Schofield, Competitive Bodybuilder, "Safe Exercising and Weightlifting, Self-Defense"

Exhibit Booths

In and around the auditorium and courtyard

Sandia Medical — Blood Pressure and Cholesterol Screenings
Safety Engineering Department — At-Home Safety, Ladder Safety, Power Tool Safety
Mountain States Sports — Firearms Safety, Storage
KAFB Fire Department — Extinguishers, Fireworks
Animal Humane Association — Pet Safety at Home & Traveling
Zee Medical — At-Home Defibrillators
SERP — Hiking and Camping Safety
Rescue Recon and Incident Commanders — Search & Rescue

And Much More!
http://safetyfair.sandia.gov/

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http://www.sandia.gov/LabNews

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LOCKHEED MARTIN

Sympathy

To Claude Potter (4122) on the death of his mother, Dorothy Marie Potter, 78, June 8.

Lab News Reader Service

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

* * *

Retirees (only): To notify of changes in address, contact Carol Wade, Benefits Dept. 3332, at 505-845-9705, e-mail cawade@sandia.gov, or Mail Stop 1021, Sandia National Laboratories, Albuquerque, NM 87185-1021.

Others: To receive the *Lab News* or to change the address (except retirees), contact Michelle Fleming, Media Relations and Communications Dept. 12651, 505-844-4902, e-mail meflemi@sandia.gov, or Mail Stop 0165, Sandia National Laboratories, Albuquerque, NM 87185-0165.

Employees: To change the number of copies of the *Lab News* your Mail Stop is receiving please call Honario Anaya, Mail Services Team 10268-4, at 844-3796. At Sandia/California contact the Mail Room at 294-2427.

Web Users: The *Lab News* is on the Web at www.sandia.gov/LabNews.

Employee death

Ron Bentley of NW Planning, Operations & Integration Center 9700 died unexpectedly June 13.

He was 64 years old.

Ron was a Senior Engineer and had been at Sandia nearly 40 years.

He is survived by his wife Gloria, son Douglas (2356), and daughter Deborah Cabrales.

RON BENTLEY

Org. 9200 joins MESA TOP II

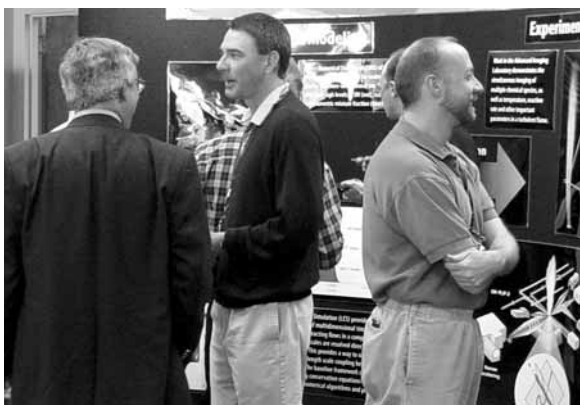
Org. 9200 (Computation, Computers, Information and Mathematics) is now onboard the new MESA TOP II facility, which is tasked with designing a lighter, smaller synthetic aperture radar device. Steve Thomas (9211) will aid in optimizing the design of a phased array antenna to enable advanced beam-pointing capabilities in the next generation SAR.

For the record

Don Cook is not retiring from Sandia, as was reported in the previous issue of *Lab News*, but is on leave to help lead the Lockheed Martin bid for LANL.

Keepers of the flame:

Combustion Research Facility celebrates 25th anniversary



FORMER SANDIAN Mitchell Smooke (back to camera) and (from left) CRF staff members Andy Lutz and David Leahy socialize in front of displays highlighting CRF research. Smooke is a professor of applied physics and director of undergraduate studies at Yale University.
(Photo by Daniel Strong)

Returning "alums" joined with current staff members and managers on May 20 for a reunion in celebration of the Combustion Research Facility's (CRF) 25th anniversary. The celebration drew about 150 attendees for an informal afternoon ceremony that included remarks by current and former CRF directors, a reunion video, and visits to labs.

Deputy director Bob Carling, who emceed the event, made a special presentation recognizing five current staff members and managers who have been at the CRF since its beginning as "CRF originals." They are Don Hardesty (8360), Pete Witze

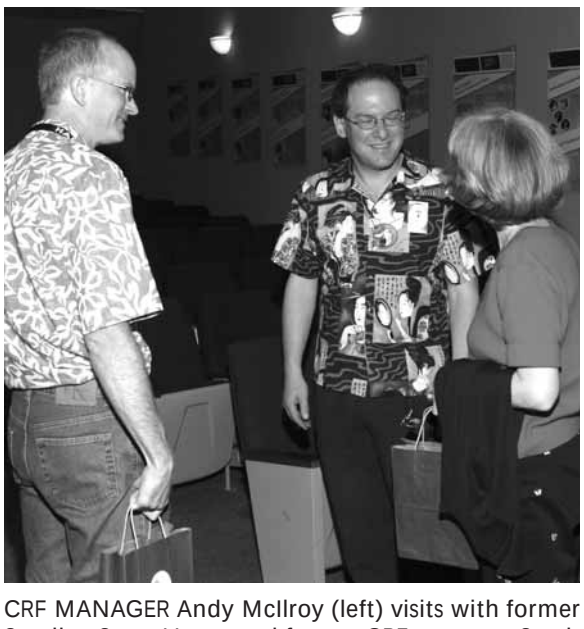
Sandia CaliforniaNews

(8362), Jim Miller (8353), Larry Rahn (8350), and Alan Kerstein (8351).

Founding director Dan Hartley, who was out of the country and unable to attend, sent videotaped remarks in which he touched on important people, events, and milestones in the establishment of the CRF. He recalled the energy crisis of the early 1970s in which Americans experienced long lines at gas stations and gasoline rationing. "We had a passion to do something about those gas lines," he said.

He recalled the "unexpected gift" that Sandia received from Volkswagen during his two-year benchmarking tour of facilities in Europe that were conducting combustion research. Volkswagen offered Sandia a combustion simulator with optical access that had taken years to develop. Sandia researchers were able to quickly get it operational. "That was a remarkable gift that got us going at a very important time," Hartley said.

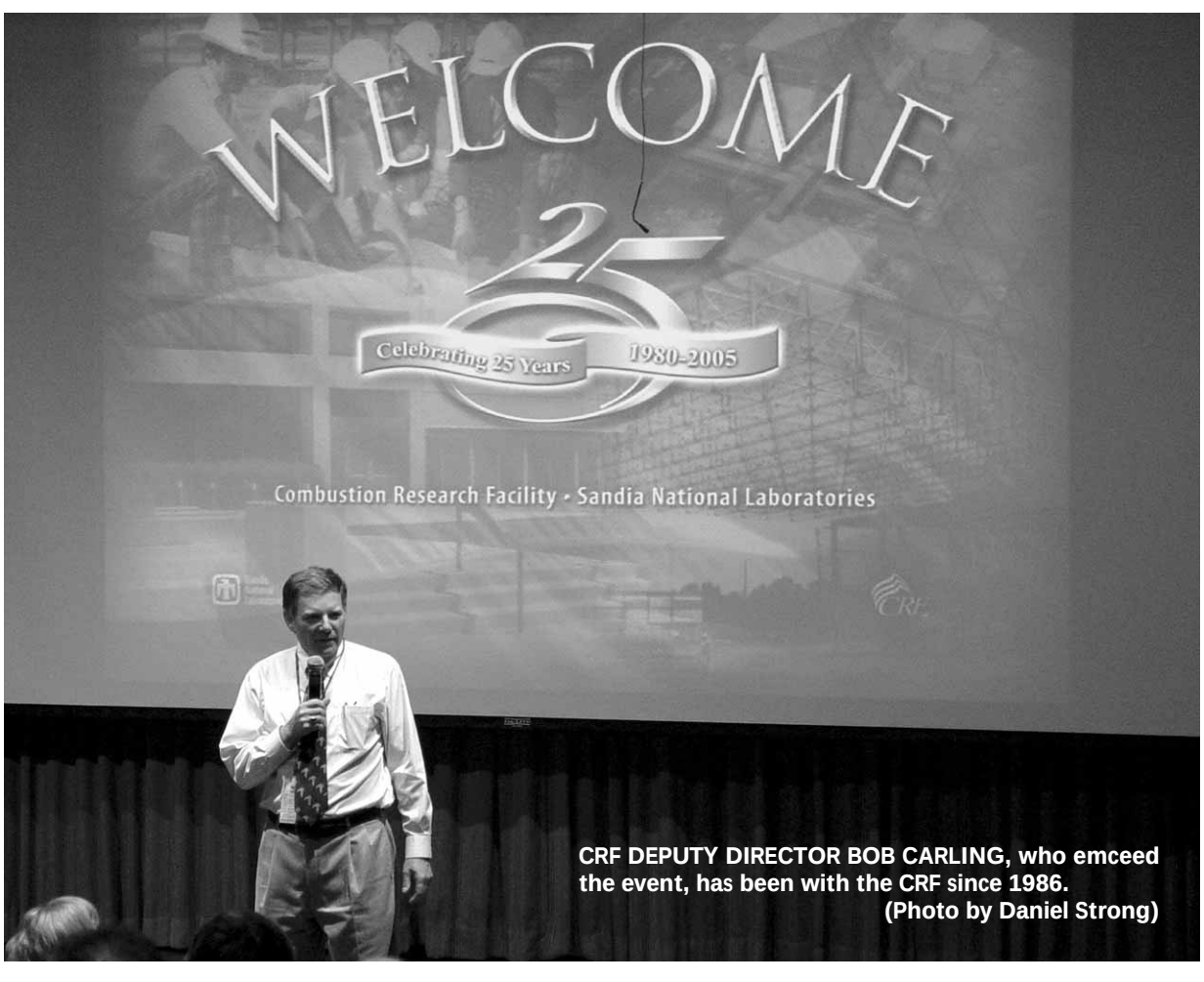
Former directors Peter Mattern and Bill McLean also spoke, as did current director Terry Michalske. Former Sandia/California VP Tom Cook joined the gathering by phone. — *Julie Hall*



CRF MANAGER Andy McIlroy (left) visits with former Sandian Steve Vosen and former CRF manager Sarah Allendorf (8753). Vosen is a Berkeley patent agent.
(Photo by Randy Wong)

FORMER AND CURRENT CRF staff members re-created a 1984 group shot that had been taken in the CRF auditorium.
(Photo by Randy Wong)

BIG FOUR — Larry Rahn, Jim Miller, Don Hardesty, and Pete Witze (left to right) have all worked at the CRF since it opened in 1980. They were recognized during the reunion ceremony as CRF "originals." Not pictured was CRF original Alan Kerstein.
(Photo by Daniel Strong)



**CRF DEPUTY DIRECTOR BOB CARLING, who emceed the event, has been with the CRF since 1986.
(Photo by Daniel Strong)**

Solar

(Continued from page 1)

electricity to nearly 370,000 residential, commercial, and industrial customers in Tucson and surrounding areas. The PV field in Springerville covers 44 acres with 26 nearly identical systems. It is one of the largest PV plants in the world and "currently the most energy-productive," says Tom Hansen, TEP vice president and technical advisor. The PV collectors produce DC power and have inverters that convert it to AC that can then be connected to the electric grid.

Most of TEP's PV efforts are in support of the Arizona Corporation Commission Environmental Portfolio Standard goal that encourages the utility to generate 1.1 percent of its energy through renewable resources by 2007 with 60 percent of that amount from solar. The portfolio standard pays for the equipment, and TEP installs and maintains it.

"The PV units we studied were installed in a standardized cookie-cutter approach where each uses the same fixed flat-plate array field design, collector and mounting hardware, electrical interconnection, and inverter unit," Larry says.

A SUNNY DISPOSITION — Larry Moore is working with an Arizona power company to examine the viability and prospects of photovoltaic solar power. (Photo by Bill Doty)

The joint TEP and Sandia report, which looks at four years of plant operation, finds that the PV units work generally well and could possibly have a life span of 25 years. Because the inverters are of a newer design, it's more difficult to tell how long they will last.

With 2,175 annual peak sun-hours of solar resource, sunny Arizona can produce a lot of electricity.

Larry says during 2004, the full Springerville PV plant generated 7,064 MWh of electricity, "sufficient for 780 Arizona homes while displacing fossil fuels with clean generation." Also the plant's availability that same year was 99.72 percent, quite high for any energy generation option.

A factor noted in the report is that maintenance issues are important to large-scale PV electricity production. This involves how often they fail, what's needed to repair them, and costs of repair. Over the Springerville's PV systems operating history from mid-2001 through 2004, the units were repaired 94 times in "unscheduled maintenance events." These resulted in the loss of generating capacity that affected one or more systems and required human intervention to restore the systems to full operational capacity.

The maintenance events could be as simple as a manual restart of a tripped inverter or considerably more complex, such as the repair of damage from a lightning strike. Scheduled maintenance involved mowing native vegetation and visually inspecting plant equipment on a yearly basis.

Cost of generating electricity at the Springerville PV plant is considerably higher than at typical coal plants. But with the Arizona Corporation Commission paying for the purchase of the equipment, plus depreciation and tax credits, the PV cost is in the range of 10 cents a kilowatt hour, compared to 3 cents in more traditional electricity generation.

"The country needs new energy; PV is cost-effective for some off-grid applications at this time and Arizona utilities with Sandia support are working to make grid-tied applications a more acceptable energy choice," Larry says. "This work helps to understand how PV can operate in a utility environment."

Sandia Thunderbirds retiree club invites you to join

The following item was provided by the Coronado Thunderbirds, the social and recreational club for Sandia retirees.

Hey, retiree, or soon-to-be retiree, you are invited to join the Coronado Thunderbirds. We used to be a subgroup of the Coronado Club but we are now a subgroup of the Mountain View Club (MVC, formerly the KAFB East Officers Club).

The advantages of belonging to the Thunderbirds are many. We have an active bridge group, a very active RV group, and a computer group. We work with the MVC to stage special events such as a Halloween Costume Ball and a Noon Year's Eve party for those who don't want to stay up for a midnight event.

We have group trips to all-inclusive resorts in Mexico and the Caribbean; bus trips to Laughlin/Las Vegas and Branson; ocean and river cruises; and tours of North and Central America. It's more fun when you travel with a group of friends. If all this and more seems interesting, call our membership chair Charlie Vittitoe, 299-9298.

You must join, or be a member of, the MVC to join the TBirds. Membership in the MVC has many advantages.

First you get a discount of $2 on dinners and brunches for you and all of your guests and $1 on lunches. Membership in the MVC gives you access to some of the DoD facilities on the base. We get a 10 percent discount at the golf course, bowling alley, and the restaurants at these facilities. Use of facilities such as the base gym, swimming pool, and the library is being negotiated.

Call Thunderbird President Rod Boenig, 836-6977, for details on how to obtain MVC membership as a Thunderbird, and the financial bargain it is.

Active denial

(Continued from page 1)

Non-Lethal Weapons Directorate's Vehicle Mounted Active Denial System (VMADS) and the Office of Force Transformation's (OFT's) project SHERIFF.

Steve Scott, Sandia's Access Delay Technology (4122) department manager, says, "DOE and Sandia have been closely tracking ADT developments and have recognized its potential to enhance the protection of DOE nuclear facilities. This has been confirmed this by conducting a feasibility study in 2002, under the supervision of researcher Jim Pacheco [4122]."

Acting on the feasibility study's conclusions, SSA's Carl Pocratsky (SO-20) initiated an effort at Sandia to explore and develop a small Active Denial System (ADS) that is more suitable for DOE fixed-site applications. To date, DoD efforts have focused on larger systems, considered by many to be better suited for military applications at extended ranges.

In 2004, the AFRL's Human Effectiveness Directorate (HEDR) completed a study that analyzed preexisting test data to estimate the potential effectiveness of what could be achieved with an ADS that has a smaller beam. Also in 2004, Sandia conducted simulations of how the smaller ADS might be used and how it would perform against adversary attack scenarios within a DOE facility using the Joint Conflict and Tactical Simulation (JCATS) software modeling tool.

"The results of the AFRL small beam ADS effectiveness study and the JCATS study were very encouraging and provided a strong basis for continuing the development of a comparitively small ADS for DOE fixed-site applications," says Jim.

"Recently there has been significant progress with this project," says Willy Morse, Sandia's principal investigator. "On May 5 we took acceptance of the SSA ADS prototype system built by Raytheon's Advanced Electromagnetic Technologies (AET) Center in partnership with CPI and Malibu Research. Initial characterization and performance tests were completed at the end May."

On May 19 a memorandum of understanding was completed between DOE-SSA, Sandia, DoD-OFT, and AFRL. This memorandum establishes a formal partnership between the DoD and DOE in developing small-sized ADSs. During the next six months the AFRL's Human Effectiveness Directorate, Brooks City-Base, is being funded by the OFT to complete human effects testing. This testing will use the SSA ADS system to determine its effectiveness for DOD applications and validate the conclusions of the 2004 small-beam-size effectiveness study sponsored by SSA. Testing results from Sandia, AFRL, and OFT will guide the operational concept and design of a second-generation small-size ADS system expected to be fielded at several DOE nuclear facilities as early as 2008. DOE-SSA and Sandia will continue to actively seek opportunities to collaborate with other government agencies on technical issues associated with developing and deploying ADS systems.

System uses beam of electromagnetic energy to heat human target

Active Denial Technology (ADT) provides an effective nonlethal active-response mechanism to disperse, disturb, distract, and establish the intent of an intruder.

ADT emits a 95 GHz nonionizing electromagnetic beam of energy that penetrates approximately 1/64 of an inch into human skin tissue, where nerve receptors are concentrated. Within seconds, the beam will heat the exposed skin tissue to a level where intolerable pain is experienced and natural defense mechanisms take over. This intense heating sensation stops only if the individual moves out of the beam's path or the beam is turned off. The sensation caused by the system has been described by test subjects as feeling like touching a hot frying pan or the intense radiant heat from a fire. Burn injury is prevented by limiting the beam's intensity and duration.

DoD-sponsored millimeter-wave human effectiveness testing, initiated in 2001, has demonstrated ADT as both effective and safe without any long-term effects. It is expected that the DoD-funded human effectiveness testing of the small-beam ADS by the AFRL HEDR during the next six to eight months will validate its effectiveness and safety as a nonlethal weapon system.

Silly Putty probe yields non-silly results about time-dependent material properties

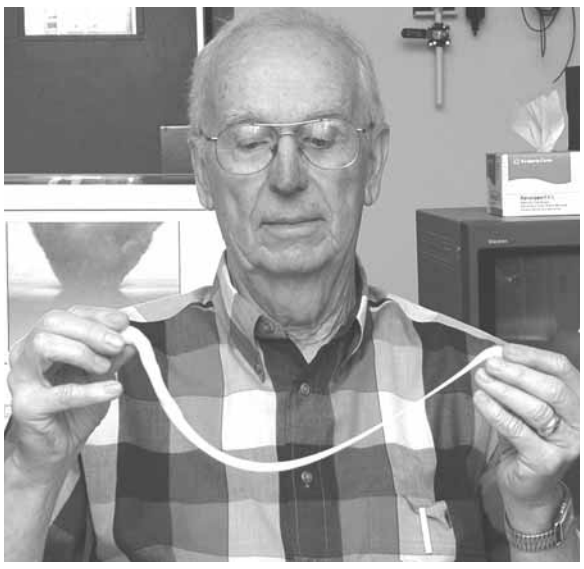
Jack Houston's microscope tip charts relaxation of solid liquid

By Neal Singer

Leave it overnight on your papers and it's sticky as bubblegum. Pat it into a sphere and it bounces like a tennis ball. Hit it sharply with a hammer, and it separates with edges flat as crystal.

Silly Putty™. The words should strike fear in the hearts of experimentalists dealing with viscoelastic materials. The polymeric stuff creeps forever under a static load, so conditions of the experiment continually change. Worse, the stuff strongly adheres to probes: Blind sensors register little data.

However, Sandia researcher Jack Houston (1114) sees the solid liquid merely as the most extreme representation of a common modern material: particles encased in a polymer matrix. These include golf club shafts and rocket fuel, polymers bonding steel to cement, and rubber bands. All these polymers (and many others), elastic at first, weaken over time, leaving golf clubs creaky, compressing rocket fuel into a bomb, weakening cement, and causing aged rubber bands to snap when stretched.



JACK HOUSTON stretched his imagination to come up with a novel way to study complex polymer matrices, for which this sample of Silly Putty served as a proxy material.

What's needed, Jack thought, are better methods to locally measure the effect of time on these polymer chains and to set up a chart of expected deterioration rates. Methods used today either involve bulk probes or don't have quick enough response to map time-dependent effects. Jack felt he had a better product: the interfacial force microscope, which he invented 15 years ago and on which he and Bill Smith (1114) recently obtained a patent for an updated sensor.

Like the show-business phrase about making it in New York, Jack figured if he could measure the time response of silly putty — the most experimentally difficult of all polymer matrices — he could make such measurements on any polymer matrix.

Avoiding unpleasant outcomes

Characterizing matrix deterioration in the laboratory could alert manufacturers or users before unpleasant outcomes come to pass. And timetables of matrix decay could be established, if suitable measurements could be made to examine the pace at which a particular matrix changes.

"We started out wanting to study adhesion in a more fundamental way by actually watching the bond form and subsequently fail," says Jack of his efforts of a decade ago. At that time no technique was available to make such measurements.

And it wasn't as though anyone recently radioed Jack to say, "Houston, we have a problem." But it occurred to him that his microscope could solve this increasingly widespread problem of measuring local changes in matrix behavior better than any other tool.

His results, supported by DOE's Office of Basic Energy Sciences, have been accepted for publication by the *Journal of Polymer Science B (Physics)*.

The IFM is unique in being able to obtain quantitative and mechanically stable data of both the adhesive interaction and a material's time-dependent mechanical properties. It's like the atomic force microscope, or AFM, but that popular technique suffers from being mechanically unstable, says Jack. It snaps in and out of contact, like trying to bring two kitchen magnets, one in each hand, together controllably.

A NEW WAY OF SEEING — Jack Houston has used his own invention, the interfacial force microscope (recently enhanced with new capabilities) to study the effects of aging on complex polymer chains. (Photos by Bill Doty)

The IFM, on the other hand, has a tip located on one end of a very small "teeter totter," which is supported by torsion bars above two tiny capacitor pads. When a sample is brought very near the tip, the force of attraction between the tip and sample causes the teeter to totter, increasing the capacitance of one and decreasing the other. The key to the IFM concept is that this rotation is forced to zero by a feedback system, which places the proper voltages on the capacitor pads. Forces are thereby measured quantitatively by the amount of voltage necessary to achieve balance without tip motion.

Deforming the material

By pushing on its target, the probe deforms the material. The measurable force changes with time and depends on the nature of the material. Suddenly advancing the tip into Silly Putty results in a spring-like deformation and a large initial force, which rapidly decays as the material creeps away from the tip in a viscous flow, leaving behind a dent.

"This tells you how much stress the material can tolerate and over what period of time the stress can be maintained, which can be translated into the material's frequency response," says Houston. The microscope measures this stress response in a few seconds, with results that matched 10 to 12 individual frequency tests by a classical rheometer.

Rheometer tests are done on bulk samples and consist of a series of measurements over a range of frequencies. Such measurements can take several minutes, during which time the sample can creep and change the experimental conditions.

The IFM measurement gives the details on how the material reacts to being deformed and is done in a time frame where the experimental conditions remain the same.

There are currently 17 IFM machines in use at Sandia and various universities around the US and in Canada.

Houston expects more next year when a newly patented laser interferometric measuring system replaces the simple radio-frequency bridge system that can't be scaled to smaller sensor dimensions. The new system achieves greater sensitivity.

Linton Brooks honors two Sandia teams with NNSA P2 'green' awards

NNSA ADMINISTRATOR Linton Brooks personally presented two 2005 DOE/National Nuclear Security Administration Best-in-Class awards to Sandia during a special pollution prevention (P2) award ceremony June 9 in Bldg. 802. One was for "JCEL—Sandia's First Green Building." The other was for "SNL/NM Bldg. 805 Decontamination and Decommissioning Project." Here Brooks gives the Bldg. 805 decontamination and decommissioning award to team leader Nick Duran (shaking hands) and other team members, from left, Doug Vetter, Phillip Rivera, Carole Meincke, and Su Hwang. At right is Carolyn Holloway (NNSA/Sandia Site Office P2 Coordinator). Not pictured are team members Andy Martinez and Jack Mizner. Members of the JCEL (Joint Computational Engineering Laboratory) team honored are Jim Dawson (team leader), Ralph Wrons, Roy Hertweck, Doug Vetter, John Zepper, Carl Bennett, John Harding, Mike Pacheco, Rick Ramirez, Dennis King, Eddie Garcia, and Mike Rocco (all Sandians or on-site contractors); Kable Oldham and Larry Wright (Hensel-Phelps); and Jack Morgan (architect with Benham in Oklahoma City). (Photo by Bill Doty)

Tom Sanford shares European physics prize for work on Z

Key observation led to huge increase in Z machine power output

By Neal Singer

In the late afternoon of July 6, 1995, Sandia researcher Tom Sanford (1677) looked at data representing the first Z-pinch implosion ever achieved with a large number of target wires — 90 — and saw a sight that stunned him.

What he saw became arguably the most important observation ever made in transforming Z into the most powerful laboratory X-ray source in the world.

The greater number of wires and subsequent implosions on the Saturn pulsed power generator increased the output radiation pulse from aluminum wire arrays to 40 terawatts, three times the X-ray power measured from Z-pinch implosions of similar wire materials.

The experiment on the Saturn facility showed it was possible to concentrate the X-ray output from a 100-nanosecond-long Z-pinch implosion into 3 nanoseconds. Formerly — using 24 wires or less, the standard for decades — the X-ray pulse was longer than 15 nanoseconds.

TOM SANFORD at Sandia's Z machine. (Photos by Bill Doty)

The result led to a furious burst of work by Sandia technical staff that produced nearly 80 terawatts (TW) of X-ray power from tungsten wire arrays on Saturn. The increase in X-ray output increased the excitement about the potential of the on-going project to convert the more powerful PBFA-II (a pulsed power machine that bombarded targets with lithium ions) into a high-current driver for Z-pinch implosions. Completed in September 1996 and using large numbers of wires, the accelerator — dubbed Z — soon produced more than 200 TW of X-rays for stockpile and fusion energy purposes.

For his observation, and for follow-up work by Tom with other Sandians, and for work by Russian and English colleagues, all of which continue to this day, Tom will share the European Physical Society's Hannes Alfven Prize. Tom and the other recipients, Malcolm Haines, former director of London's Imperial College Plasma Physics Dept., and Valentin Smirnov, director of the Institute of Nuclear Fusion at the Kurchatov Institute in Moscow were cited for "the remarkable achievements of the multi-filament Z-pinch development in the recent years."

The three will share a prize of 5,000 Euros to be awarded on Monday, June 27, at this year's annual meeting of the Society in Barcelona, Spain.

Both Smirnov and Haines, in separate interviews with the *Lab News*, described the considerable depth and longevity of their own contributions to Z-pinch development but graciously gave credit to Tom and Sandia for his observation and the Labs' subsequent validating tests by a number of personnel.

"[Tom's] technical observation was correct, but he had to be stubbornly persuasive to get resources transferred to this [multifilament] area," observed Haines.

Said Smirnov, "The greatest achievement [in Z-pinch work] was made by Sandia in increasing the radiating material of the wires and in reconstructing PBFA II to Z."

Says Tom, "To prove out an idea like this, you need community. And I had it at Sandia." He particularly mentioned support from Gerry Yonas (16000), Wendland Beezhold (ret.), Ray Leeper (1677), John Maenchen (1645) , Tom Nash (1677), Barry Marder (ret.), George Allshouse (deceased), and Ray Mock (1677).

What Tom saw

A Z-pinch is so named because the electrical current that vaporizes slender wires hanging vertically — to mathematicians, the "z" direction of space — in a cylindrical pattern also creates a magnetic field that pinches the resultant ions into a much smaller volume.

Energy is emitted when ions stop suddenly upon arrival at the center of the cylindrical array.

The general assumption before Tom's 1995 observation was that plasma — a field of ions — generated by cylindrical arrays containing 24 wires or less, themselves formed a cylindrical cloud or "shell" that compressed evenly by the action of the overall magnetic field.

That assumption led to a consensus that adding more wires would cause only marginal improvements in the X-ray energies generated by their plasmas. It was a convenient belief. Though theorists at the Naval Research Laboratory had advocated increasing the number of wires in the array, adding wires was a laborious process. The wires were only microns thick and snapped easily. And so the overall experimental consensus held for decades.

What startled Tom in January of that year was that pictures taken by a new pinhole camera showed a completely unexpected effect. The pinhole camera was state of the art: it had electronics that allowed a nanosecond exposure and no lens to shatter from the force of an explosion; its focal length alone, predetermined merely by the camera's size, was enough to take pictures of unequalled clarity. Aided by protective devices, it could be placed close to the wire array.

What its film showed was that a single magnetic shell was not formed by the vaporized wire ions. Instead, individual shells formed around each wire. Each wire, in effect, was self-pinching. And each lurched inward, inharmoniously with its neighbors, in the grip of the overall magnetic field.

"If they're clumping like this," thought Tom, "[using only] a few wires seems like a bad idea."

Installing many more wires in the array, he thought, might create the magnetic shell mistakenly thought to be already in place.

If the amount of energy already achieved were merely the result of individual wire shells in effect staggering inward, how much more energy could be obtained from an implosion involving many more wires that created a true shell that compressed coherently toward the center of the pinch?

(Continued on next page)

Dear Tom: colleagues, peers — friends — praise Tom Sanford's work

Dear Tom,

. . . You made the discovery that changed the entire field, and you should be very proud. I am personally very grateful.

Sincerely, Gerry Yonas, Oct. 16, 2000

"I have been researching pulsed-power-driven, high-atomic-number Z-pinches for 27 years. . . . I have worked closely with Dr. Sanford since he entered this field. . . . Dr. Sanford revolutionized the field within a year of entering it by dramatically increasing the power of X-[ray] radiation from wire-array loads, thereby reinvigorating a languishing field. This advance has led to new directions and emphases in the Sandia National Laboratories ICF and Weapons Physics programs."

— David Mosher, Naval Research Laboratory and Fellow of the APS

"For fundamental advances in understanding of wire array Z-pinches, which led to improved load symmetry and greatly increased radiative power, and opened up the possibility of using wire arrays as drivers for inertial confinement fusion."

— American Physical Society Fellowship Citation for Tom Sanford

"For many years it was known . . . that the conversion of electrical energy into implosion kinetic energy . . . would benefit greatly from improved cylindrical symmetry. . . . Achieving this with gas puffs and thin foils proved sufficiently difficult in practice that the highest power levels that the soft X-ray radiation output never led to serious proposals to develop Z-pinches for high-gain laboratory inertial confinement fusion experiments. . . . Although it was postulated that cylindrical wire arrays with large numbers of wires would be better than small numbers of wires . . . conventional wisdom was that 25-40 wires would be enough to achieve adequate symmetry. . . . Luckily for the dense Z-pinch field, Dr. Sanford actually did the experiment instead of just talking. . . . The series of experiments carried out by Dr. Sanford and coworkers with aluminum wire arrays . . . effectively re-introduced the Dense Z-pinch into contention . . . for high-energy physics experiments. . . . "

— David Hammer, electrical engineering professor, Laboratory of Plasma Studies, Cornell University

"I had the privilege of being shown all these data, and being able to assist in finding an explanation of many of the novel features of [Sanford's] experiments. What came through is his thoroughness with experimental diagnostics, his tenacity in pursuing the novel results, and his determination to explore the full parameter space. As a result, his data on aluminum wires are the most complete. . . . His publications involve many authors from several laboratories, and are characterized by an impressive amount of data, interpretation, and modeling. . . . His experimental research on imploding wire array Z-pinches has triggered the recent enormous growth of interest in the field. . . ."

— Malcolm Haines, professor at the Imperial College of Science, Technology and Medicine, London

"It was Tom's critical thinking and personal determination in advocating the exploration of the high-wire-number of nuclear Z-pinch arrays that led to a fundamental breakthrough in Z-pinch performance over the past few years. He and his colleagues . . . developed fundamental insights into the dominant physics of the high-wire-number Z-pinch arrays . . . [which] are now being exploited to develop new high-power X-ray sources that open new and innovative applications in high-energy-density physics."

— Kenneth Whitney, Radiation Hydrodynamics Branch, Naval Research Lab

From supercomputers to the network control center, Archie Gibson tends Labs' computer facilities

Geeks tweak, cowboys ride herd, says team leader Archie

By Elizabeth Malone

If you've ever doubted that geeks and cowboys can work side by side, Archie Gibson (9335-2) will set you straight. He'll also point out the essential difference: Sandia geeks tweak software while Sandia cowboys work with people and conduct the "daily care and feeding of the machines."

To Archie, these machines — Sandia's supercomputers — behave like very dumb livestock that can't recognize when they are insecure or overheated. Dressed in a western shirt, jeans, and boots, Archie moves comfortably between the worlds of Red Storm and other supercomputers at Sandia and rodeos in Los Lunas with his kids and grandkids. To hear him mention his "12 or 15 head of horse" or hunting in the mountains, no one would suspect he has worked on some of the fastest computers in the world.

"My friends roll their eyes when they envision a cowboy in the computer center," Archie says.

This veteran Sandian has cared for his Labs "livestock" for almost 39 years. He graduated from Rio Grande High School in May 1966 and started work in the Sandia mail room the following October. Two years later, gambling that "computers may go for a while," Archie moved to computer operations. He climbed up the ranks from data clerk to operations control analyst to his current position of leader of the Computer Operations Team.

COWBOY ARCHIE GIBSON tweaks his "livestock." (Photo by Randy Montoya)

"I've learned a thing or two in the Sandia school of hard knocks," Archie laughs. "But I've worked in here with some of the world's smartest people. I'm like a sponge; I soak it all up." Now, he modifies facilities, supervises daily upkeep, provides monitoring and operations support, and ensures physical security and employees' safety.

"He's our compliance guy for anything dealing with space utilization," says John Noe (9328).

Archie's latest projects include Red Storm, the Labs' supercomputer currently undergoing software modifications. Archie helped prepare the facility in Bldg. 725 and continues day-to-day care and feeding — especially cooling — of the four rows and 12,000 processors that compose the multi-teraflop machine. One of his greatest challenges, he says, has been developing the 34 air conditioners that surround Red Storm. Instead of the liquid cool plumbing that runs through the motherboards of the typical Cray supercomputer, Red Storm uses the less expensive, easier to install method of blowing 1,000 tons of air through the computer cabinets.

He's seen both liquid-cooled and air-cooled systems; he has gone from manning the computer tape library years ago to now planning to make Red Storm a remote-monitored machine. He'll point out the oldest computers, data storage "silos" operated by an "egg-beater" robot, and the newest supercomputing clusters. The most advanced of these computers have earned the title of fastest in the world in 1993, at 143 gigaflops, and 1997, breaking the teraflop barrier at 1.6 teraflops.

"The place has changed so much; it's not the same place anymore," says Gloria Gibson (5996), Archie's wife. She used to work with computer operations also but now provides computer desktop support to Center 5900.

"I'm in the PC world now, and he does that on the big level," she says.

As he walks through research or enterprise computing centers, the Oklahoma native jokes around with coworkers — and is addressed as "sir." John Noe and Michael Hannah (30) praise Archie's friendliness, attention to detail, integrity, and his bridge-playing skills as evident in a lunchtime bridge game that has continued for the last 20 years.

"He's a great guy, both professionally and personally," says Michael. "He won't cut corners. He does the job right." A shy outdoorsman, in his own words, Archie is the first to give credit to others and deny that he is a "computer jockey" or an expert.

"It's a big cyber world, and I'm a little piece of it." Then he grins. "Make that an old little piece of it."

Remembering the hundreds of people who have passed through computer operations over his career, he tells of one middle-school boy who visited the network control center, known as the heartbeat of Sandia, during Take Your Sons To Work Day. The kid was less than impressed: "It just looks like a bunch of refrigerators, Dad."

"I enjoy people more than machines," Archie says, referring to computers as big monsters that have conversations and live in a barn. A recent power failure took all day to fix, he says, because every computer is unique; machines are like people. But in the final analysis, despite any resemblance, "machines are just a bunch of inanimate objects. People walk through, and they leave tracks in your life. Life's about people."

Sanford & Z

(Continued from preceding page)

The force created might exceed the simple addition of individual wire plasmas added to other wire plasmas.

Because of the complexity of building arrays with large numbers of wires, the experiment had never been tried.

Tom, with aid from other Sandians, proceeded to find out.

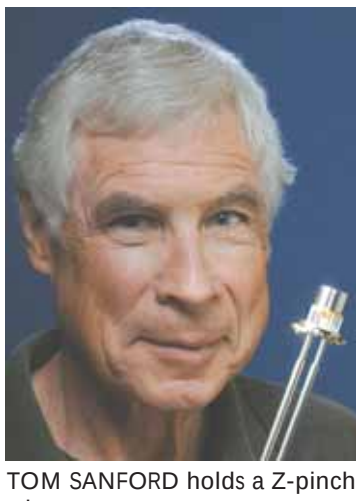
He had been trained by two high-energy physics Nobel laureates — Leon Lederman and Sam Ting — not to settle for inconclusive solutions.

In the tenacity of his experiments, says his manager Ray Leeper simply, "Tom's a bulldog."

Tom set up a series of experiments, using different radii of wires with spacing adjusted to keep the total wire mass constant, to determine whether wire size and spacing had any appreciable effect as his team painstakingly measured X-ray output produced by arrays ranging from a very small number to hundreds of wires. The results were clear. A larger number of thinner wires with minimum spacing between them sent the output of Saturn, and then Z, skyrocketing, and eventually caused a change in the world scientific view of the Z-pinch process.

"When I saw the narrow radiation pulse emerging from a 90-wire array, I knew that by significantly increasing the number of wires we had cracked the instability nut that had plagued Z-pinches for a number of decades," Tom said.

Said Haines, "When Tom got those spectacular results by increasing the number of wires and decreasing their separation and found the X-ray yield went up enormously, that's what alerted us. We switched to tungsten wires from cryogenic deuterium fiber."



TOM SANFORD holds a Z-pinch wire array.

The fibers at Imperial College were an attempt to achieve fusion directly, rather than the two-step process at Z of first bottling tungsten plasma-produced X-rays in a hohlraum to then attack a deuterium pellet.

"I knew it was going to be a big deal," says Tom, "but I didn't know how big.

"Where it ends up, we don't know yet. But it's regenerated a worldwide effort on Z-pinches."

Tom, who has been "riding the tsunami of papers" generated by his discovery, has since then been "swimming in the ocean of Z-pinch physics," (as he phrases these things), turning out more than 20 papers in the last 10 years on the phenomenon, and his work is ongoing.

Co-winner Malcolm Haines' contributions to Z-pinch work began in the mid-1950s with his PhD thesis in 1957, when he predicted the conditions for the explosions of single wires and the amount of current necessary in Z-pinches to produce thermonuclear fusion. He continued over decades with theoretical explanations and practical experiments that relied upon results from the smaller pulsed power machine at Imperial College. Among his contributions was a theory that satisfactorily explained the increase in power generated by the increased number of wires of the Z-pinch.

In recent work with David Lepell (1646), Chris Deeney (1640), and Christine Coverdale (6744), he proposed a solution for why more energy is radiated than the energy of the implosion. "I like a mystery," he said.

The contribution of co-winner Valentin Smirnov's group stretches back to the 1980s, when gas puffs were considered a possible source of ions for Z-pinches. "Smirnov's group provided incentive to us to push the pinch," says Gerry Yonas. "They had insights into pinches before we did. We sent a team to measure their results, and they sent a team here."

Center 9500's software process certification offers indisputable evidence of excellence

By Bill Murphy

"Evidence, not assertion."

When Tom Hunter was chief of the Labs' Nuclear Weapons SMU, that was the standard he set for his organizations. "Don't tell me; show me. Prove it to me."

Information Systems Development Center 9500 took Tom at his word. It has earned the much-sought-after Software Capability Maturity Model® (SW-CMM®) Level 3 certification. That's "show me" with an exclamation point.

LISA TRAINOR, manager of Dept. 9521, captures the spirit of pride felt by team members upon learning their Center had earned CMM Level 3 certification.

The SW-CMM standard was developed by the Software Engineering Institute (SEI) at Carnegie-Mellon University in the 1980s at the request of the Department of Defense.

According to Joe Schofield, who has led the Center's CMM certification process, DoD turned to Carnegie Mellon after being frustrated one too many times by software suppliers who weren't able to deliver on their promises and commitments. The SW-CMM certification gives customers a level of confidence that their software vendors are able to perform and deliver at a high — and quantifiable — level.

CMM isn't quite comparable to ISO certification or Malcolm Baldrige certification. For example, while ISO provides general criteria for a range of products and services, the SW-CMM is software-specific, covering 208 practices in the areas of project management, requirements management, configuration management, training, product engineering, peer reviews, quality assurance, project control, and affected groups. An organization seeking CMM certification is assessed in each of those areas.

Today the SW-CMM and its successor, the Capability Maturity Model Integration, or CMMI®, are the most widely used and recognized software assessment frameworks in the world. Organizations that seek SW-CMM certification, such as Center 9500, are formally assessed by independent SEI-certified lead appraisers and are provided with a maturity level that ranges from 1 to 5. Movements up the maturity scale, from 2 to 3 for instance, are inclusive of the practices of lower maturity levels. (Although the scale goes up to 5, a Level 3 certification is, in fact, a very significant recognition of an organization's level of performance.)

Tom Hunter appreciates the evidence of excellence provided by Center 9500's SW-CMM certification. Says Tom: "An essential part of our future and focus on performance excellence is the evaluation and certification by internationally recognized authorities. In software development, that standard is clearly the SW-CMM and the CMMI. It is a tribute to Center 9500 to achieve their certification. I congratulate them on their hard work."

"We've really busted our tails for this, both management and staff" says Joe. He says Center 9500 has been actively seeking CMM certification for six years, launched by then-director Paul Merrillat (since retired). Sandia, Joe notes, had long had its own internal assessment process for software development, but Paul Merrillat was convinced that the Center could make greater strides by measuring up to an outside, independent set of standards and practices. On its journey — that's what Joe calls it and how the Center sees it — toward CMM certification, the Center partnered with TeraQuest Metrics (now Borland) in 2003 to accelerate and focus its efforts.

There were additional factors pushing the Center toward the CMM standard: DoD, and increasingly, other potential customers, are virtually insistent upon CMM certification for any organizations producing software for them. And Lockheed Martin, like DoD, is very aggressive in requiring vendors to hold CMM certification.

For some perspective of what's involved in attaining level 3 certification, consider that less than 1 percent of software projects are CMM-assessed worldwide, and of those, less than 50 percent of organizations (surveyed by Carnegie Mellon's Software Engineering Institute) have moved from level 2 to level 3 and only 15 percent to level 4 or 5.

Center 9500 has already attained level 3, and as far as Joe is concerned, there's no end in sight: "Our journey is about software process improvement," says Joe. "This [certification] isn't the end. We'll continue to learn. I see this entire effort as a maturing and a growth process."

Joe says that perhaps "the biggest kick [in the entire certification effort] was sharing the good news with Tom Hunter on his very first day as Labs President. I couldn't think of a better update to give him. And, of course, he was very pleased."

Pleased, indeed, with Center 9500 for providing evidence, not assertion.

What does Level 3 certification mean?

According to Wikipedia, the open-source online encyclopedia, the standards and expectations for CMM Level 3 certification are summarized as follows:

• At maturity level 3, processes are well characterized and understood, and are described in standards, procedures, tools, and methods.

•

• The organization's set of standard processes, which is the basis for level 3, is established and improved over time. These standard processes are used to establish consistency across the organization. Projects establish their defined processes by tailoring the organization's set of standard processes according to tailoring guidelines.

•

•The organization's management establishes process objectives based on the organization's set of standard processes and ensures that these objectives are appropriately addressed.

•

• A critical distinction between level 2 and level 3 is the scope of standards, process descriptions, and procedures. At level 2, the standards, process descriptions, and procedures may be quite different in each specific instance of the process (for example, on a particular project). At level 3, the standards, process descriptions, and procedures for a project are tailored from the organization's set of standard processes to suit a particular project or organizational unit.

Current health care trends: Up and up

This article is the first in a series about health care and Sandia. The article was prepared for the Lab News *by Health, Benefits, and Employee Services Center 3300.*

Health care costs are rising. It's been in the news for years and we read about it every fall in these pages during our annual Benefits Open Enrollment. There are trends that contribute to these cost increases, and there are trends that have arisen as a result of these cost increases. We'll talk about both in this article.

From 1999 to 2003, there was a 39-percent increase in the per capita spending for services covered by private health insurance. In the same time period, there was only a 14-percent rise in the average hourly earnings of US workers. With such a sharp rise in costs, it's not surprising that one of the trends we read about is the increasing numbers of uninsured Americans.

At Sandia we will have experienced a doubling of annual health care costs between 1995 and 2005 (from $49.7M to a projected $104.5M). Do you know that in 1995 the monthly premium for a family of three or more in the top medical plan was $450 (with a Tier 1 premium share of $48)? This year, it is $993 (with a Tier 1 premium share of $153).

Why are health care costs increasing so dramatically? The simple answer is that Americans are using more health care services, such as physicians, diagnostic testing, and hospitals. We are living longer and the services we require as we age often use new technology. Some of this technology is more expensive. Some is simply more effective, less invasive, or causes less discomfort to the patient and therefore results in higher rates of use. Other factors are higher rates of prescription drug use and more expensive prescription drugs. This ultimately translates to the higher premiums and out-of-pocket costs that you end up paying.

An employer's ability to remain competitive is also affected by these higher health care costs. Sandia is no exception. The cost of benefits directly impacts a company's labor rate. When health care costs rise, the labor costs rise and the company becomes less competitive. Employers must balance their ability to attract new customers with their ability to attract and retain employees. In a future article in the series, we'll explore just how Sandia's benefits compare to similar employers.

Health care costs represent a significant piece of the benefits cost "pie" for many employers. As such, there lies great potential for cost control in health care benefits. We are certainly aware that companies are asking their employees to share more and more of the burden of health care costs. At Sandia we saw this in 2002 when the percentage of the premium that you pay was increased and we see it in periodic plan design changes. The media is also full of stories of companies revamping — or at worst eliminating — retiree benefits as a way to control costs.

Employers are beginning to attempt cost control through health care consumerism. This emerging trend is basically a push for employees to be more aware of how they use health care services. An example of health care consumerism in practice is when an employee purchases a generic prescription drug instead of a brand-name drug. This purchase decision can save the employee and the company a significant amount of money, with the same treatment outcome. In another example, employers provide trustworthy health information that helps the employee make the best possible health care decisions. Companies are increasingly recognizing that active employee involvement in their own health care is needed in order to control costs without sacrificing quality care.

Later in the series we'll further explore how Sandia is reacting to these health care benefits trends. In the next issue of the *Lab News*, we'll talk about what you can do to help lower your health care costs.

Sandia unions with support from upper management make ***Cuidando Los Niños*** van a reality

By Iris Aboytes

Sandia unions saw a need in the community and took the initiative to respond to that need. *Cuidando Los Niños*, a United Way Agency, was in need of a new van. Their van had more than 300,000 miles on it and was on its second transmission and third air conditioner. *Cuidando Los Niños* is a place of refuge, hope, and new beginnings for homeless children.

Sandia unions, with upper management following their lead, raised enough money for the down payment on a new van.

Former OPEIU union member and retiree Suzanne Visor went on a United Way Agency tour that included Cuidando Los Ninos. While on the tour she heard that they were in dire need of a new van.

When Suzanne went to her next OPEIU meeting she told members of *Cuidando's* need (*Lab News*, Oct. 15, 2004). Members decided OPEIU would donate $1,000 from its treasury. It would also contact members of Sandia's other two unions and ask them to match OPEIU's contribution. There was no hesitation from the other unions. SPA contributed $1,000 and Metal Trades donated $800. OPEIU's hope was to raise seed money for the new van. They were sure that together they could do it.

THANKS, GUYS AND GALS — Kids at *Cuidando Los Niños* are all smiles as they check out the new bus provided in part with funds raised by Sandia's unions, with help from management and Lockheed Martin. (Photo by Bill Doty)

Over the winter break, then Senior VP Tom Hunter read about the unions' desires to help (*Lab News*, Dec. 10, 2004). He called former VP and ECP Corporate Champion Lenny Martinez with questions. They decided members of Sandia's management would support the unions' efforts by matching the amount raised.

"This is not the first time Tom has worked behind the scenes to do good for the community," says Lenny. "It is visible now but primarily because it was such a terrific need and a creative solution initiated by Suzanne Visor and the represented communities, complemented by management. It's a great example of how Sandians work together to solve hard problems."

Sandia management raised an additional $3,275 through United Way. An additional $2,000 came from Lockheed Martin corporate contributions.

"We are so pleased to see OPEIU, SPA, and Metal Trades take on the initiative to support *Cuidando Los Niños*," says Sandia President Tom Hunter. "It represents the true giving nature of Sandia and was a wonderful opportunity for us to assist our community. We were honored to be allowed to participate and hope that our gifts show Sandia's united support for a most worthy organization."

Cuidando Los Niños purchased a low-mileage 14-passenger 1999 GMC Collins bus to replace the dilapidated 15-passenger van that it had been using for the past 12-and-a-half years. "Each seat is equipped with seatbelts and special child-size harnesses to provide an extra level of safety for the children we transport," says Suzanne Farley, executive director. "The bus is used to transport the children to and from childcare at *Cuidando Los Niños* on a daily basis as well as to transport the children and their parents on community enrichment field trips such as the Zoo, Bio Park, or Explora Museum [partially funded by a grant from Sandia National Labs]."

In New Mexico 40 percent of the homeless are families with children. Nationally the average age for a homeless person is six. *Cuidando Los Niños*' 75 percent success rate aims to change those numbers.

"Without the support of the folks at Sandia, we would not have been able to purchase this bus," says Farley. "Their fundraising efforts were critical in filling our need to provide transportation for our kids. Sandia is a wonderful community partner, and we are blessed by the level of support, compassion, and care this organization shares."

Management promotions

New Mexico

Mike Maurer from Manager, Business Service Manager Dept. 10758, to Level II Manager, Division and SMU Business Operations Dept. 6030.

MIKE MAURER

Mike joined Sandia in 1986 where he worked in the Purchasing Policies and Procedures Division. He then held a variety of buying positions where he supported the Nuclear Waste and Transportation Program, Renewable Energy Program, and the Services Procurement Dept. He also had an 18-month temporary assignment to Sandia/California's procurement department supporting the Combustion Research Facility and ES&H Program.

When he returned to New Mexico, Mike worked in the ES&H program management office where he managed the Tiger Team Response, Building Coordinator, and ES&H supplemental manual projects. Following this, he was promoted to Division 1000 Business Office Manager. He transferred to the Engineering Sciences Center to be the Center Business Manager when the Division 1000 office was dissolved as part of a reorganization. From there he was selected to be the Division 6000 Business Manager.

In October of 2000, Mike left Sandia for about two years to take a job as the Procurement Manager at Lucent Technologies' Omaha, Neb., facility. He returned to the Labs as the Division 6000 Business Manager.

Mike has an MBA in Materials and Logistics Management and a BS in Engineering Arts, both from Michigan State University.

* * *

Beth Potts from Manager, Integrated Security Business Management Dept. 10514, to Level II Manager, Integrated Security Business Management Dept. 4010.

BETH POTTS

Beth joined Sandia in 1992 as an OAA after working for Security Savings Bank for 12 years and departing as Vice President, Loan Servicing. From 1996 to 2000, Beth served as a project manager for several advanced weapon technologies projects and became a Certified Project Management Professional through the Project Management Institute. Beth specializes in project management, financial management, and business operations.

In 2001, she became manager of the Center Business Operations Dept. 5302 and then manager for Integrated Security Business Management Dept. 10514 in 2003 and matrixed to Integrated Security Division 4000 to the present.

Beth has a BBA from UNM and an MBA from the College of Santa Fe.

* * *

Ken Chavez from PMTS, Stockpile Evaluation I Dept. 2951, to Manager, Flight Systems Dept. 15424.

KEN CHAVEZ

Ken joined Sandia in 1987 in the Aeroballistics Department and was assigned as the lead aerodynamic design engineer for the Navy's B90 Nuclear Depth/Strike Bomb. Subsequent assignments included serving as program lead in aerodynamic and flight dynamic design and development of various nuclear weapon systems, conventional weapon systems, and small rockets. These responsibilities included modeling and simulations, wind tunnel tests, full-scale flight tests, and field operations.

One of Ken's most notable accomplishments was his instrumental role in the original conceptual design, development, and successful fielding of Air Force's B61-11 nuclear gravity bomb.

His most recent assignment was in the Stockpile Evaluation group where he served as the lead system evaluation engineer responsible for the surveillance flight and lab test programs of the B83 nuclear gravity bomb.

Ken has a BS in mechanical engineering from New Mexico State University and an MS in aerospace engineering from the University of Michigan.

* * *

Rebecca Horton from Manager, Entry Control and Contraband Detection Dept. 4118, to Level II Manager, Advanced Security Technologies Group, Dept. 4120.

REBECCA HORTON

She joined Sandia in 1984 and has worked primarily in safeguards and security programs for both domestic and international applications.

Rebecca recently managed a technology-based group that develops and evaluates systems for access control in high-security areas such as biometric recognition systems, smart cards, and for detecting contraband such as explosives, illicit drugs, metallic weapons, and potential chemical weapons.

Previously, Rebecca was program manager for the International Materials Protection Program at Sandia from its inception in 1994 to 2000. In this role, she managed Sandia's portion of the Russia/Newly Independent States Material Protection Control and Accounting Program and the R&D programs for on-site monitoring in arms control and nonproliferation applications.

Rebecca worked on temporary assignment at DOE Headquarters in 1994 supporting the Office of Arms Control and Nonproliferation on international work in a number of countries on the physical protection of nuclear materials.

Prior to management, she worked on video

(Continued on next page)

Mileposts

New Mexico photos by Michelle Fleming


Doyle Morgan
45 2565


Johann Seamen
35 1671


Gerald Van Slambrook
35 5531


John Taylor
30 5915


Lorraine Clayburn
25 2913


Mark Geerts
25 2991


Jay Grimley
25 12127


Fran Nimick
25 6140


Elizabeth Richards
25 6216


Raymond Sanchez
25 12341

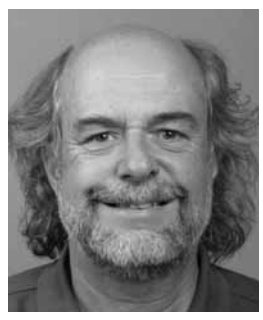

William Yelton
25 1743


Lawrence Armijo
20 4211


Cynthia Caton
20 9623


Dennis Lierz
20 5733


Michael Partridge
20 5919


Ralph Tissot
20 1822

Promotions

(Continued from preceding page)

image and signal processing technology development and implementation projects for domestic security at DOE sites and for international safeguards for the International Atomic Energy Agency.

Rebecca has a B.S. in electrical engineering from New Mexico State University and an M.S. in electrical engineering from Stanford University.

She is a member of the Institute of Nuclear Materials Management and the Phi Kappa Phi Engineering Honor Society.

* * *

Jennifer Nelson from Manager, New Initiatives Dept. 9209 and Evolutionary Computing and Agent-Based Modeling Dept. 9216, to Level II Manager, for the Computational Science R&D Group Dept. 9230.


JENNIFER NELSON

Jennifer began working at Sandia in 1983 in Access Denial Technology where she worked on mechanical design, fabrication, and testing of access denial components and systems.

In 1986 Jennifer became the project leader for the Proof of Concept/Experimental Testbed and for the Military Intelligence Information Processing System. She also went on a two-year assignment in Washington, D.C., to the Phase One Engineering Team, which supported the Strategic Defense Initiative Organization. She was promoted to DMTS in 1992.

In 1992, Jennifer became the manager for the Environmental Restoration Technologies Dept. 6621. At this time, she was also coordinator of the Mixed Waste Landfill Integrated Demonstration Program. In 1996, Jennifer went on to assist a lab-wide group of directors with strategic planning for the Critical Infrastructure Surety Program. She was also instrumental in creating the National Infrastructure Simulation and Analysis Center (NISAC), a partnership between Sandia and LANL that provides new technical planning and decisions for the analysis of critical infrastructures, their interdependencies, vulnerabilities, and complexities; she went on to become NISAC's first Interim Joint Program Director.

Jennifer was also the 6000 Deputy to the Nuclear Weapons Strategic Management Unit and participated in the National Security Leadership Program.

In her previous position, as manager of both Dept. 9209 and Dept. 9216, Jennifer teamed with other managers and staff to develop the vision and path forward for a computational climate program and broadened the Agent-Based Modeling Program's customer base. Jennifer has a BS in mechanical engineering from the University of Nebraska and an MS in mechanical engineering from Stanford.

California

Dawn Manley from PMTS, Systems Studies Dept. 8114, to Manager, Reacting Flow Research Dept. 8351.


DAWN MANLEY

Dawn joined Sandia in 1999 in the Systems Studies department and worked in the area of systems modeling and analysis for chemical and biological defense programs.

These programs were initially supported through the DOE Chemical and Biological National Security Program, and more recently supported by the Department of Homeland Security (DHS) and DoD's Defense Threat Reduction Agency (DTRA).

Dawn served as the Labs' lead in the BioNet program, a cooperative effort between DHS and DTRA. She has led a variety of projects for the rapid deployment, monitoring, and control of sensor systems in facilities as well as for the development of simulation decision analysis tools for bioterrorism preparedness.

She has also collaborated with Alameda County and local airport officials to develop community preparedness exercises to address the response to bioterrorism threats.

Dawn has a BS in chemical engineering from Stanford, an MA in chemical engineering from Princeton, and a PhD in chemical engineering, also from Princeton.

Recent Retirees


Glen Fowler
43 4151

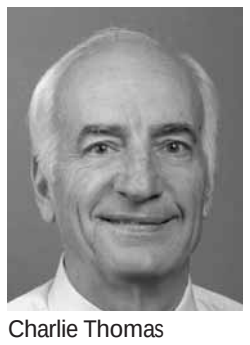

Tom Prevender
35 5937


Dwight Jennison
28 1114


James Furaus
25 6923


Carlos Griego
25 3010


R. Sue Henderson
25 3555


Charlie Thomas
13 12120

Cinderella men, women box a good game

572 senior citizens declared winners at Food Box - ing Olympics

By Iris Aboytes

The thermometer registered 72 degrees, the sky was clear, and there was a slight breeze. You could hear a pin drop as teams from Sandia and Wells Fargo prepared to participate in the first annual Food Box - ing Olympics at the Roadrunner Food Bank.

Team Sandia stretched, took deep breaths, and tried to remain cool as they went over their strategy. Team Wells Fargo huddled, prepared for battle, and encouraged each other. They were ready! Anticipation was high as each team member tried to stay mentally and physically prepared.

The bell rang and the excitement escalated as grocery carts containing boxes were filled with 28 to 30 items for senior citizens. The carts were powered by the participants wearing turbo-propelled sneakers. In went the tuna. The green beans tried to jump out only to be retrieved by the slippery salmon. The pintos had no chance as the peanut butter kept them steady. The pasta and the tomatoes also tried to escape only to be overpowered by the chunky soup. It took Sweet and Low to get them all in order.

After each box was filled, Roadrunner personnel taped it closed. The team member then went back to the beginning where boxes were put together by members using super thing-a-ma-jiggies loaded with tape. One by one each box was filled.

It was neck and neck as the participants' dripped with perspiration and adrenalin reached a new high. The competition took 15 minutes. Team Sandia was powerful, methodical, and determined. Team Wells Fargo was speedy, cohesive, and confident. The teams were worthy competitors as they kept the prize in mind.

After 15 minutes there was a definite winner, or rather several winners. A total of 128 boxes were filled by the two teams. That translated to 128 senior citizens with diabetes receiving boxes filled with food specially formulated for them.

Ten teams from different companies participated in the Olympics. According to Melody Wattenbarger of the Roadrunner Food Bank, 572 boxes were packed. The competition was held on June 7, National Hunger Awareness Day.

Team Sandia was made up of Raeanne Aragon (10263), Shannon Letourneau (10263), Carolyn Lucero (10263), Pauline Bruskas (10263), Jan Wallner (102631), Scott Neely (102632), and Doug Weaver (10710), cheerleader. Each team was required to have a media participant. Sandia's media participant was Steve Lawrence from *Crosswinds Weekly*.

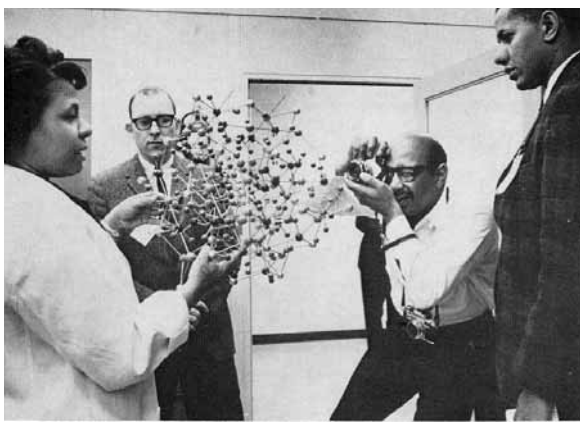
TEAM SANDIA on the left and Team Wells Fargo on the right pack boxes for senior citizens. From front to back the Sandia participants are Jan Wallner, Scott Neely, Raeanne Aragon and Carolyn Lucero. The two women taping boxes in the back are Pauline Bruskas (left side) and Shannon Letourneau (right side). (Photo by Bill Doty)

This monthly column highlights Sandia Lab News *items from 50, 40, 30, 20, and 10 years ago, but each column does not necessarily include items from each decade.*

50 years ago . . . An editorial in the June 3, 1955, issue noted that June was not only a traditional wedding month, but also the month in which more security violations typically occurred. We don't know whether this is still true, but the editorial speculated that the typically beautiful June weather may have turned employees' thoughts toward vacations, fishing, and other warm-weather activities at some expense to proper attention to security. The write-up also mentioned some advice from a security poster that's still good today: "Be sure the brain's engaged before you put your mouth in gear." The same issue featured a Sandia rocket-powered pendulum used in sustained and impact shock testing of nonnuclear components of atomic weapons. Designed, engineered, and built by Sandia, the pendulum was highly instrumented and powered by a "blazing battery of up to 50 bazooka rockets" fired simultaneously. The rockets accelerated the pendulum and test objects to a force up to 40 G's (40 times the force of gravity).

PENDULUM ENGINEERS–Standing before the rocket-powered pendulum in a Sandia technical area are Bill Duggin and Bob Hager. The device was used for shock testing.

40 years ago . . . Sandians at the Tonopah Test Range (TTR) were super busy completing a big series of aircraft flight tests for the Joint Task Force Two (JTF-2) program directed by the Joint Chiefs of Staff. The June 4, 1965, *Lab News* explained that the program was evaluating the low-level capabilities of many tactical and strategic aircraft weapon systems and the defense against such systems. Sandians at TTR had completed 172 JTF-2 flight tests, with 300 more scheduled before the end of July. The national news media have long been interested in Sandia activities. The June 18 issue noted that *EBONY* magazine had just run a six-page feature article on Katheryn Lawson of Sandia's Crystal Physics Division and her husband, Kenneth, titled "Scientific Couple Finds Success in Albuquerque."



KATHERYN LAWSON of the Crystal Physics Division was photographed by Ted Williams for a feature article in *EBONY* magazine. Jim Mitchell (second from left) of Sandia's Public Information Division assisted in the arrangement. Louis Robinson (right) was *EBONY's* West Coast Editor.

30 years ago . . . Sandia's new, improved retirement plan was announced in the June 13, 1977, issue. The basic features of the new plan: (1) No further contributions by employees, (2) Pension benefit based on high-five salary years instead of career average, (3) Retirement became possible at age 50 with 25 years of service, or at any age with 30 years of service, and (4) Increased survivor benefits. (The next major retirement plan improvements and changes, with benefits now based on high-three salary years, were announced nearly 25 years later in the Feb. 22, 2002, *Lab News*.)

10 years ago . . . Many employees were already planning what they would do with their three-day weekends every other week as non-represented Sandians were becoming eligible July 1 to begin the now very popular 9/80 work schedule. The June 9, 1995, issue clarified the rules and answered a number of related employee questions. Represented Sandians became eligible for the program later that year after the issue was bargained with the three unions. — *Larry Perrine*