

Labs' pulsed power team achieves record-breaking X-ray outputs on its Saturn accelerator

Peak outputs quadrupled in six months

By John German

Lab News Staff

Some recent work, combined with some innovative thinking, has resulted in a major technical breakthrough for Sandia's pulsed power program.

Six months ago, the maximum peak radiation output ever generated during a "shot" inside the Labs' Saturn accelerator was about 20 trillion watts (terawatts). In recent weeks, Saturn's X-ray output has more than quadrupled, to about 85 terawatts.

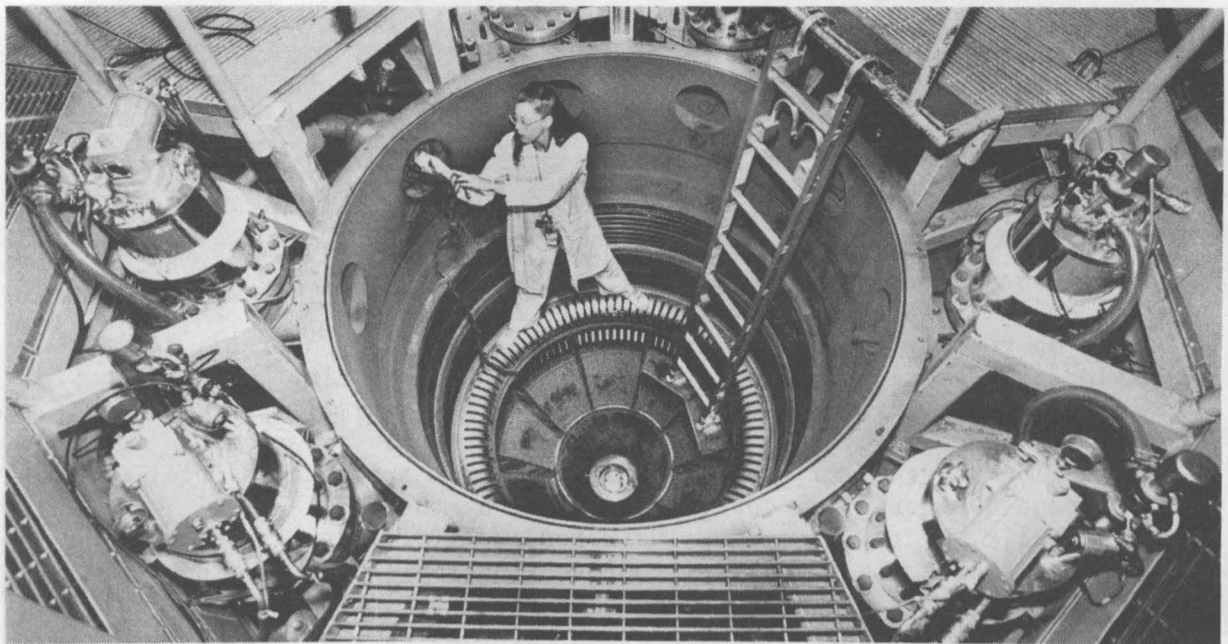
The breakthrough has "altered the mindset we've been operating with" about

Saturn's capabilities, says Don Cook, Director of Pulsed Power Sciences Center 9500.

"Controlling the symmetry of the implosion was the key," he says.

In simplest terms, a pulsed power accelerator such as Saturn uses a series of capacitors, or

The breakthrough has "altered the mindset we've been operating with" about Saturn's capabilities.



LIGHTNING STRIKES HERE TWICE DAILY — Roberta Hanes, a contractor in Saturn Operations Dept. 9342, removes volt monitors from the center section of the Saturn pulsed power accelerator in Area 4 following a recent shot. In recent months, the Labs' pulsed power team has conducted about two shots a day inside Saturn, one of four major accelerators currently operated by Sandia. (Photo by Randy Montoya)

electrical dams, to build and store electrical charges over a period of time, then simultaneously discharge them in fractions of a second. As the electrical floodgates open, the resulting

electrical pulse drives very high currents through a target area. Collectively these currents, something like a tight bundle of lightning

(Continued on page 4)

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Paul Robinson makes Labs' case at Congressional hearings

Sandia and the other DOE nuclear weapons laboratories are in a "precarious position" in trying to carry out their mission in the face of budget constraints and a variety of policy challenges ranging from tritium production to the prohibition of certain laboratory facilities under new treaty restrictions.

That is the assessment Labs Director and President C. Paul Robinson offered to members of Congress during testimony before House and Senate subcommittees in Washington March 12. The directors of Lawrence Livermore and Los Alamos national laboratories also testified before the US Senate Armed Services Committee, Subcommittee on Strategic Forces, and the US House of Representatives National Security Committee, Joint Hearing of the Subcommittee on Military Procurement and Subcommittee on Research and Development. The subcommittees play a key role in setting spending levels for the national labs.

Paul reviewed for lawmakers recent policy decisions that have defined a clear-cut post-Cold War mission for DOE's nuclear weapons laboratories. That mission, he reminded them, was spelled out explicitly by President Clinton last August, when he affirmed America's commitment to a safe and reliable nuclear stockpile.

"I am assured by the Secretary of Energy
(Continued on page 3)

"I have always believed the nation is best served when its ultimate defense, its stockpile of nuclear weapons, is not the subject of partisan contention."



LIVING HISTORY — Edward Teller, director emeritus of Lawrence Livermore National Laboratory, was one of the guests at a community meeting that was part of Sandia/California's 40th anniversary celebration March 7. Here he talks with Labs Director C. Paul Robinson prior to the session. See pages 6 and 7 for more coverage of the site's 40th anniversary event.

'Crazy' states can be understood, prof says at Labs colloquium

8

If you need it, find it here — Reapplication goes on-line

9



This & That

More weird names and addresses - Continuing from the last issue with more strange addresses and spellings on Sandians' mail:

Three employees submitted examples of probably the most common foul-up of Sandia: San Dia. Brandon Ahrens (5415) received a bill addressed to him at Sandra Leebs. Jenifer Leon (8421) got mail addressed to Dandia Natinal Labs, with the greeting, Attn: Mr. Leon. Sharon Gorman (4415) of the Tech Library sent two: One was addressed to Ms. Sandia Natl Labs, with the greeting, Dear Ms. Labs: The other to Ms. Sandi Nat Labrtrs, noting that "The favor of a reply is requested, Ms. Labrtrs."

All of the following prove just how tough Albuquerque can be on poor spellers: Clyde Lane (5337) received a proposed agenda for Sandia visitors who thought they were visiting Sandia Labs in Albequaque. Our mail room was unable to deliver a package addressed to Buddy Anderson (no one on roll by that name) at Sandia Natl. LA in Albacerqui. Retiree Don Lundergan received the first few issues of a magazine subscription addressed to him in Albiyuyce (pronounced "Alba-yucky?"). Reggie Tibbetts (7613) received literature addressed to him at Gandia National Labs in Albuquerque; it said he could contact the company's local agent in Alburquerque (original correct spelling, by the way).

Finally, my two favorites: Mark Boslough (9232) sent a copy of an old letter from an American firm representing some Japanese products, addressed to Sandia National Rubber Factories. Bill Jacklin (5913) sent a magazine label addressed to him (with his name slightly misspelled) at Saudia Network Labs in Acbua, NV; it came through because it did have Sandia's correct zip code and Bill's correct mail stop.

* * *

Rename "Large Staff?" - Speaking of strange names, I mentioned in the last issue Sandia's "Large Staff," a term that's been used for many years to mean upper management: directors and above. I'm not sure how long the term has been used, but it was used in the past to distinguish directors and above from "Small Staff," an outdated term that once designated Sandia's vice presidents and the president. I've always disliked the name Large Staff, and since it's now basically meaningless without its counterpart, I propose that we put on our thinking caps and come up with some suggestions to rename this august group. If you have suggestions, send them to me at the address at the bottom of this page. And by all means, let's remember that our leaders have feelings, so show them some respect and don't submit irreverent suggestions. You can bet that names such as "Majestic Muckety Mucks," "Big Brass," "Exalted Rulers," and "Sandia Sultans" won't get serious consideration.

* * *

Open house coming up - Those of us who moved into the new Communications Center (Bldg. 811) several weeks ago are pretty much settled and organized again - well, as organized as we ever get. Everyone is welcome to come see us (Bldg. 811 is north of Bldg. 800, outside the tech area), but you may want to wait until our open house in early May (watch for an announcement next month). We'll provide free ice water, some doughnuts left over from our last staff meeting, and maybe even some free moving boxes. Hey, what do you expect when our budget is shrinking faster than a cheap flannel shirt?

- Larry Perrine (845-8511, MS 0165, lgperri@sandia.gov)

Sandia LabNews

Sandia National Laboratories

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Fun & Games

Fun Run - Mark your calendars for Sunday, April 14, for the National Council on Alcoholism and Drug Dependence (NCADD), Albuquerque Area Inc., fourth annual Run for Recovery fund-raiser featuring 5K and 10K runs and a 2-mile competitive walk. The race begins at Carson Park. Registration is \$12 through April 9; \$15 thereafter, up to the day before the race. Registration includes T-shirt and door prizes. For information, call NCADD at 256-8300 or Gil's Runnershoe World at 268-6300.

* * *

Tennis - The Pre-USTA League Tennis Tournament scheduled for April 13-14 will be held at the Coronado Club tennis courts. Events include men's and women's singles and doubles. Gift certificates will be presented to winners and runners-up, along with other prizes. Drinks and balls will be provided to all participants. SERP and Coronado Club members and military personnel are invited to participate. Participants' guests may play doubles. Entry deadline is April 8. For more information and entry forms, contact the SERP office at 844-8486.

Random drug testing for Labs executives discontinued

Sandia has discontinued a two-year-old program that required Labs executives, including directors and above, to be tested annually for possible drug use.

When the program was initiated in January 1994, Martin Marietta's corporate policy required that employees in positions of substantial responsibility and influence be tested for use of illicit or illegal drugs to ensure their fitness for duty. Medical Center 3300 (Sandia/New Mexico) and Medical Dept. 8527 (Sandia/California) administered the tests to every Sandia executive at least once a year at random, unannounced times.

Sandia canceled the program last month when concerns were raised about the legality of mandatory random drug testing, and because Lockheed Martin's new corporate policies do not require such tests. In addition, Labs senior attorney Larry Greher (11200) says Sandia has agreed not to adopt any new random drug testing programs during the next five years unless required by federal law, collective bargaining agreement, its contract with DOE, or other government direction.

Some testing required

Dr. Larry Clevenger, Director of Medical Center 3300, says the Labs is continuing its random drug testing programs for certain populations of employees, primarily employees in sensitive or potentially hazardous jobs, to ensure that they can perform their jobs "safely and reliably." Such testing is required by law. In addition, new employees and employees suspected of past or current drug use are tested. (See box: "Who does Sandia test now?" below.)

Unlike many corporate drug testing programs, he says, Sandia's programs are designed to supplement its managed care programs, in-house rehabilitation services, and benefit plan that reimburses employees who seek outside rehabilitation.

"Some companies use drug testing by itself as a deterrent to drug use," he says. "But in a laboratory of 10,000 people, a few are going to have a drug problem - that's a fact. It is our belief that Sandia's drug screening programs are very effective tools for helping rehabilitate those employees who do have problems."

For more information about Sandia's drug use policies, see Sandia Laboratories Policy 2009, "Drug-Free Workplace Program," available on the Internal Web under headings Directives, Quick Access to SLPs, and 2000 Series.

Who does Sandia test now?

Sandia currently tests the following employee populations for possible drug use:

- All new employees as a condition of employment
- Employees who access, control, or transport special nuclear materials or who handle explosives (required by DOE)
- Security police officers (to ensure fitness to handle a firearm)
- Commercial drivers (required by the Department of Transportation)
- Employees referred to Medical by their management as exhibiting behaviors that indicate possible drug use
- Employees involved in a workplace accident that may have been related to drug use
- Employees receiving treatment for past drug use through Labs-sponsored rehabilitation programs

Paul Robinson

(Continued from page 1)

and the Directors of our nuclear weapons laboratories," Clinton said at the time, "that we can meet the challenge of maintaining our nuclear deterrent under a Comprehensive Test Ban Treaty through a Science-Based Stockpile Stewardship program without nuclear testing. . . . In order for this program to succeed, both the Administration and the Congress must provide sustained bipartisan support for the stockpile stewardship program over the next decade and beyond."

Labs accepted the challenge

The DOE weapons labs, Paul said in his testimony, "stepped forward to sign up to the challenges of a future in which the ultimate security of the nation will be bet on a program of science-based stockpile stewardship, without nuclear testing, rather than on the paradigms of the past.

"To do this job," Paul said, "we must sustain a robust core capability in the scientific and engineering disciplines required to respond to emerging and unforeseen challenges relating to nuclear weapons. Yet today, that core capability is threatened by erosion of budget support that we and the White House had agreed were essential to maintain the nuclear stockpile as a supreme national interest of the United States."

Paul noted that management of the nation's nuclear stockpile has always enjoyed broad bipartisan support and that the White House and Congress have traditionally been in accord on policies regarding nuclear weapons-related issues. "I have always believed," Paul continued, "that the nation is best served when its ultimate defense, its stockpile of nuclear weapons, is not the subject of partisan contention. I thus find much satisfaction in the consistency of support for our mission by both the White House and the Congress."

An erroneous perception

In seeking a reaffirmation of that commitment from Congress, Paul outlined the scope of the Labs' work in the post-Cold War environment. That work, he said, entails critical efforts in the areas of:

Direct stockpile support. "Many people suffer from an erroneous perception that the DOE defense programs laboratories have very little [weapons] work to do right now," Paul said. "Nothing could be further from the truth. The challenges of stockpile stewardship are formidable, particularly in an era of no new weapon designs and no nuclear testing." He noted that Sandia has several important weapons projects underway with deliverables due in the next one to three years.

Maintenance of weapons production facilities. The laboratories, Paul noted, will take on a larger weapons production role in the context of a much-smaller-scale DOE production regime than prevailed during the Cold War.

Maintenance of laboratory nuclear weapons competencies. "Early on, the framers of the Atomic Energy Act decided that the technology of military applications of nuclear energy should be closely held," Paul said. "There is no industrial utility to this technology. This

technology is not taught in the universities. The expertise for US nuclear weapons resides only at these laboratories. Nuclear weapons can only be produced and their surety maintained under the supervision of these laboratories. Indeed, our confidence in the weapons that are deployed in the stockpile depends upon the continuing strong capabilities of the people who staff the DOE defense programs laboratories."

Computer modeling and simulation. Paul called this "one of the great levers of science" and said its importance to science-based stockpile stewardship cannot be overstated.

Preserving design competencies. Noting that many of the systems in the stockpile will require replacement at some point in the first half of the next century, Paul said "many of the people who will do that work are probably entering kindergarten this year. No old-timers will be around . . . we must find ways to qualify" the next-generation designers.

Multimissions 'absolutely essential'

Paul told lawmakers that in his view, a multimission, multidisciplinary environment is "absolutely essential" for maintaining excellence in the DOE national laboratories and for maintaining the leading-edge technical competencies nuclear weapons work demands.

"It is my belief that nuclear weapons will remain important for a long time to come, and I intend to manage Sandia National Laboratories strategically so that it can continue to perform its responsibilities over the long term," Paul said. "We must maintain and continuously improve the technical competencies required for this work. To do so, it is my view that the following two strategic principles must be observed:

"First, we must stay current with advances

in science and technology. Managing our nuclear weapons requires advanced technology, some of which is specific to nuclear weapons, but most of which is common to the standard science and engineering disciplines. If we don't keep up with the advancing frontiers in electronics, information science, materials science, and so forth, we won't be able to perform our mission in the long term.

"Second, we must operate as a multiple-mission laboratory. The nuclear weapons mission requires the stimulus and synergy of a multidisciplinary technical environment to be vital. The days of a high-volume nuclear weapon enterprise are over, but the requirements for laboratory excellence and a robust infrastructure remain. Only in the context of serving multiple missions can such an institutional environment be sustained."

— Bill Murphy

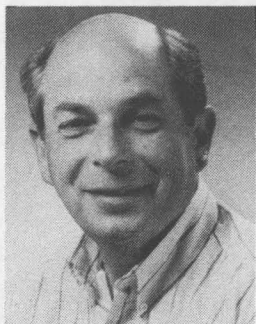
! Take Note

Retiring and not seen in *Lab News* pictures: Ann Shiver (6741), 40 years; Karl Svensson (9711), 38 years; Dorothy Marklin (12364), 38 years; William Sieger (9735), 37 years; Joe Rivera (3344), 34 years; Thomas Hobart (1481), 32 years; William Dodson (2122), 31 years; Glen Otey (5400), 29 years; and Victor Lira (9783), 28 years.

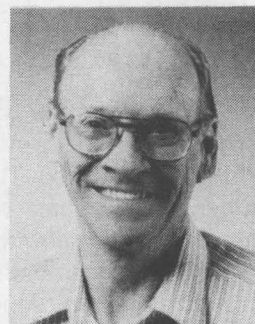
Fun & Games

Golf— The Sandia Golf Association (SGA) is starting the 1996 golf season soon. New members are always welcome. Tournament play is based on Sun Country handicaps and is competitive at all levels. To join, please contact Frank Peter (2337) at 828-9873.

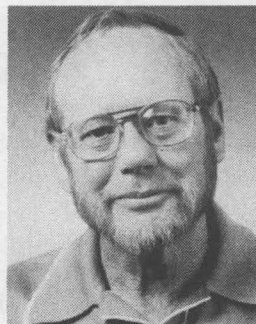
Recent Retirees



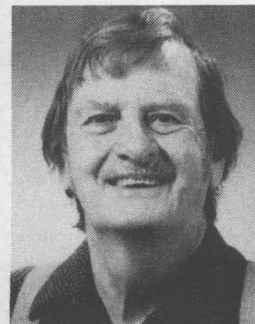
Bob Wemple 34
6111



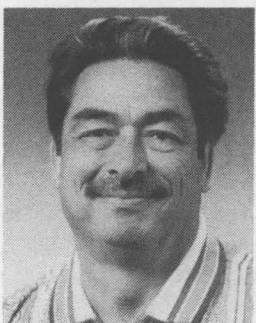
Charlie Barnes 39
1323



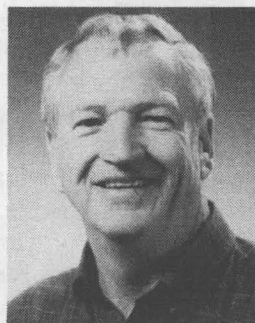
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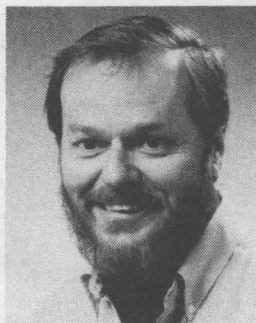
Ed Hart 38
1552



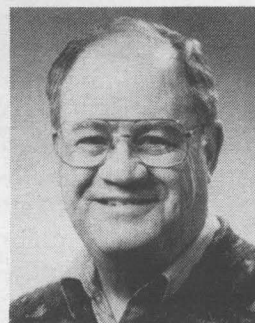
Florindo Salas 33
9342



Gene Arndt 30
9414



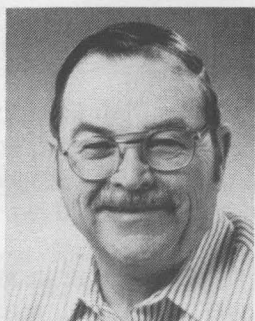
George Steigerwald 28
2343



Jon Barnette 35
1535



Larry Garrison 32
10402



Milt Stomp 36
6200



Lorene Adams 15
7615



Karen Watts 21
7711

California celebration

Sandia/California celebrated its 40th anniversary with a variety of events on March 7. See photos and text on our center spread, pages 6-7.



PULSED POWER PLANS — Pulsed Power Sciences Center 9500 Director Don Cook (with Particle Beam Fusion Accelerator II in the background) says Sandia has begun setting technical specifications for a next-generation accelerator capable of maximum X-ray outputs of 200-400 terawatts. See "Turn-of-the-century X-1 Advanced Radiation Source to succeed PBFA II" below. (Photo by Randy Montoya)

Pulsed power

(Continued from page 1)

bolts, generate a magnetic field that "squeezes" objects in the target area.

In recent Saturn experiments, circular arrays of fine tungsten wires placed in the target area are ionized into a hot plasma and their masses driven toward their axis in billionths of a second by the compressive force of the electromagnetic field.

This magnetic implosion in turn causes the split-second release of hundreds of thousands of joules of X-ray energy. The faster and more symmetrically the masses are squeezed

together, the more X-ray power is generated in the implosion, says Don.

More wires means greater symmetry

Earlier Saturn experiments employed target arrays of as many as 24 tungsten wires arranged in a circle, one every 15 degrees. What the Sandia researchers have shown in the last six months is that using more wires with smaller diameters results in an implosion with much better symmetry.

Beginning last September, the researchers upped the number of tungsten wires in the circular arrays from 24 to 40, which increased Saturn's X-ray outputs from 20 to 30 terawatts. In January, 70 wires netted 40 terawatts. By early February, the researchers were using circular

A brief history of Saturn

Today's Saturn accelerator was originally commissioned in 1980 as Particle Beam Fusion Accelerator I (PBFA I). When PBFA II was commissioned in 1986, PBFA I was reconfigured as a high-energy X-ray source. PBFA I was recommissioned as Saturn in 1987 and has been used as a laboratory X-ray source since.

Currently the Labs operates four major pulsed power accelerators: PBFA II, Saturn, Hermes, and SABRE (for Sandia Accelerator and Beam Research Experiment).

arrays containing as many as 192 very fine wires, each only a few microns in diameter. As it turns out, an array of about 120 wires works best for producing X-rays, says Don.

Why do more wires mean better symmetry and more powerful X-ray pulses? It has to do with irregularities, or "perturbations," in the plasma field, he says. When the wires ionize and begin to move inward, having fewer wires causes greater irregularities in the imploding plasma's boundaries. By decreasing the diameter of each wire and adding more wires, each wire causes less of a perturbation in the plasma field, which results in greater symmetry.

Seem technical? It is, unless you compare it to squeezing a glob of Jell-O with your fingers. "Even if you had twenty fingers, the Jell-O would just squirt out between your fingers," he

Having fewer wires causes greater irregularities in the imploding plasma's boundaries.

(Continued on next page)

Turn-of-the-century X-1 Advanced Radiation Source to succeed PBFA II

Particle Beam Fusion Accelerator II (PBFA II), Sandia's most powerful pulsed power accelerator, was originally designed to produce peak X-ray outputs of 50-100 trillion watts (terawatts). Because recent experiments on the Saturn accelerator already have generated 85 terawatts, it now appears possible to reach 150 terawatts on PBFA II, says Don Cook, Director of Pulsed Power Sciences Center 9500.

In coming months, as Labs researchers achieve those output levels on PBFA II, Sandia will begin preparations to build its next-generation X-ray source, the X-1 Advanced Radiation Source. The X-1 ARS would provide four times the peak X-ray output of PBFA II, quadrupling the Labs' X-ray-generation capabilities from 2 million joules per shot (PBFA II's peak output) to 8 million joules (megajoules).

"Until recently, our objective with the X-1 was to produce up to 200 trillion watts in a lab here at Sandia," Don says. "But the recent breakthrough on Saturn suggests that the X-1 might go even higher, possibly to 400 trillion watts."

X-1 an intermediate step

By continuing to scale up Sandia's accelerator capabilities, he says, researchers in the "laboratory" can continue to close in on approximating the extreme conditions found inside a weapon as it detonates. Future accelerators also will help validate three-dimensional computational models that simulate nuclear detonations.

Construction of the X-1 ARS, to be located in Area 4, would begin in 2000 and be completed by 2003. The pulsed power team hopes to reach the accelerator's maximum output levels by about 2005. Then, if results on the X-1 warrant scaling up further, construction of a new super accelerator currently known as Jupiter would produce as much as 32 megajoules of energy by around 2015.

Because of the amount of X-ray energy it would produce, 16 times that of the building-booming PBFA II, Jupiter would likely be located at the Nevada Test Site (NTS). "Not because of the boom, though," says Don.

Juan Ramirez (9310) and his colleagues are developing accelerator switch technologies that are more efficient and produce less of a boom than previous versions. Jupiter might be located at NTS to explore the possibility of "high gain" with Inertial Confinement Fusion (ICF) at the level of 100 to 1,000 megajoules of fusion energy, the output level needed to make fusion energy sources practical in a power plant.

Originally Sandia had planned to complete scale-up tests on PBFA II this summer, then skip right to Jupiter. "We have good theory and good experimental data now on Saturn, and we're eagerly looking forward to additional PBFA II experiments later this year," he says. "But a series of technical steps is required before we get to Jupiter. The X-1 represents an additional step."

He adds that one of Sandia's goals in

planning the X-1 is to keep the costs of the facility manageable (less than \$100 million to build), "so that the decision to construct it remains a technical and programmatic decision rather than a political one," he says.

No formal decision has been made to build the X-1, he says. Sandia has begun setting technical specifications and performing feasibility studies and cost determinations.

Why the wacky name?

VP-5000 Roger Hagenruber coined "Advanced Radiation Source" early in the accelerator's planning stages. The prefix "X-1" is a bit more difficult to explain, Don says.

Labs President C. Paul Robinson first suggested X-1 because of its connection to astronomy; "X-1" is the typical designation assigned to the "brightest thing" detected in a cluster of stars. Astronomers typically discover the brightest star in a cluster first.

One field where pulsed power accelerators like the X-1 ARS can be applied is laboratory astrophysics. Traditionally astrophysicists used telescopes to probe the universe. These days, much of the work is conducted in the laboratory as researchers attempt to characterize the material make-up of astronomical bodies based on their stellar emissions.

Paul thought the unique appellation would help Sandia remember to apply its pulsed power capabilities to fundamental science and encourage researchers at universities to take advantage of the X-1's capabilities.

3...2...1... Countdown begins for Albuquerque 'Launch Into Spring' event

Sandia is one of a dozen-plus sponsors of the "Launch Into Spring" event scheduled for Albuquerque on April 20. The event will include a mass launching of model rockets at the International Balloon Fiesta site.

Sandia will have a display booth featuring personal computers loaded with rocket performance software along with a custom-made 100-mph wind tunnel and rocket engine test stand. Sandia also will have information about space and rocketry available for teachers and a video about Sandia's rocket program. Sandia's support is being coordinated by the Education Outreach organization.

"The event is providing us with an outstanding opportunity to promote science and space exploration to the children of New Mexico," says John Whitley, a manager in Diversity Leadership and Education Outreach Center 3600. "Hinkle Family Fun Centers, the primary event sponsor, has reached out to children across the state through scouting, schools, 4-H programs, and other clubs. Participation in the event is expected to be several thousand. Sandia is involved in a wide range of activities for the day."

Video view from 3,000 feet

A Sandia video camera will be mounted to an Albuquerque Rocket Society (ARS) rocket. The high-power model rocket will reach an altitude of about 3,000 feet and requires a Federal Aviation Administration waiver for launch.

Andy Rogulich of Aircraft Compatibility Dept. 5147 says the camera will transmit real-time to a large screen on the ground, providing spectators with a sweeping view of Albuquerque. Andy is one of the founders of ARS and currently serves as its vice president. "The video will show the rocket's perspective of the

**What: Launch Into Spring!
Rocket Launch
When: Saturday, April 20,
8 a.m. - conclusion
Where: Balloon Fiesta Park**

flight," says Andy. "In addition, an on-board computer will be used to record the flight, start two of the three engines, and provide recovery ejection."

The customized wind tunnel and rocket engine test stand will provide rocketeers opportunities to measure the thrust and test the stability of their hand-crafted rockets. Contractor Mike Bernard of Intense Beams Research Dept. 9531, also a member of ARS, is the designer and builder of the two test stands for Sandia.

Sandia astronaut to promote event

The National Atomic Museum has jumped on board for the launch, also. More than a dozen children converged on the museum recently to meet Sid Gutierrez, a former NASA astronaut and space shuttle commander. Sid currently manages Electronic Fuzing and Sensors Dept. 2527. The rendezvous was for some promotional spots that KASA-TV, the Albuquerque Fox network affiliate, filmed for the Launch Into Spring. Fox Kids Club will air the spots the week of April 8. Sid also will be on hand at the launch.

The Atomic Museum will display drawings by children grades K-5 as part of a rocket drawing contest, and, in addition, the folks at the museum are helping Boy Scouts in the Albuquerque area meet requirements for the Atomic Energy Merit Badge.

The entry fee for the event will be one can



COMET HYAKUTAKE rises over the Sandia Mountains March 20 in this 20-second exposure by *Lab News* acting editor Ken Frazier from Albuquerque's Sandia Heights. The comet, the brightest in at least two decades, made its appearance in Albuquerque skies early last week. It then was obscured by nighttime cloud cover for most of the next three or four days before emerging high in the northwest sky near the Big Dipper early this week, when it passed closest to Earth, one-tenth the distance to the sun. This Tuesday night/Wednesday morning (March 26-27) it was brightly visible near Polaris, the North Star. California viewers also reported fine views of the comet, which excited scientists and nonscientists alike worldwide. It was discovered by Japanese amateur astronomer Yuji Hyakutake Jan. 30 and won't return for about 17,000 years.

of food to be donated to a local charity. For additional information, call the Hinkle Family Fun Center at 299-3100.

—Kathy Kuhlmann (12621)

(Continued from preceding page)

says. "But if you had webbed duck's feet, which is analogous to having an infinite number of fingers, you could squeeze it from all sides much more uniformly."

And, he adds, if the inward force of Saturn's magnetic pulse is timed so that it peaks precisely when the plasma field is most symmetric, you get a more uniform implosion. That's how the higher X-ray outputs are achieved. When the plasma stagnates on the target area's axis, a more uniform plasma produces a shorter — and more powerful — X-ray pulse. Saturn shot times are down from about 20 nanoseconds (billionths of a second) six months ago to about 4 nanoseconds today, he says.

Terawatts plus teraflops

Don points out that the recent results were not a complete shock to Sandia's pulsed power team. The high output levels were predicted analytically but only recently achieved experimentally. It was a breakthrough, though, because the researchers had expected to reach only about 20 terawatts experimentally on Saturn and then strive for 80 terawatts on Particle Beam Fusion Accelerator II (PBFA II), Sandia's most modern fusion accelerator. (See "A brief history of Saturn" on page four.)

"We've already passed the expected PBFA II power output levels on Saturn," he says. "The recent data make us think that maybe we can go higher on PBFA II. Our codes tell us we could get to 150 terawatts. We'll see."

He says the recent successes may accelerate Sandia's plans to build a new accelerator that can achieve even higher energy output levels.

(See "Turn-of-the-century X-1 Advanced Radiation Source to succeed PBFA II" on page four.) But primarily the results will boost the pulsed power program's ability to support Sandia's stockpile stewardship mission, he says.

Data generated inside Labs accelerators are being used to test three-dimensional computer codes being developed within the nuclear weapons complex that simulate what happens inside a nuclear weapon when it detonates, such as radiation flow and radiation coupling between the primary and secondary portions of a nuclear weapon, explains Don. Such simulations are becoming increasingly important as the US seeks a worldwide ban on nuclear testing.

"Nuclear weapons are huge sources of X-rays," he says. "Part of Sandia's science-based stockpile stewardship mission requires us to scale up both our laboratory X-ray sources and our computation capabilities so that we can do the job we used to do in Nevada, but must now learn to do without ever actually detonating a weapon. That will require simulations on very good computer codes, tested against data produced in part inside Sandia accelerators."

"Gerry Yonas [VP-9000] likes to say that it's not just terawatts that count, but it's terawatts

and teraflops together that are needed," he adds.

The increased radiation outputs will also help Labs weapons researchers study radiation-hardness issues and ensure that electronics and other components in nuclear weapon arming, fuzing, and firing systems will continue to work as expected in hostile environments, says Jim Powell, Director of Applied Physics Center 9300.

The recent successes were due to some "very talented people and a little luck," add Don and Jim. (See "Talented people contributed to Saturn breakthrough" below.)

"But mostly it was the talent," Don says. "We can't say enough about the many people who contributed."

Talented people contributed to Saturn breakthrough

Don Cook (9500) and Jim Powell (9300) say many talented people in both centers are behind the recent breakthrough on the Saturn pulsed power accelerator. People who contributed directly include Dillon McDaniel, Rick Spielman, John McGurn, Christopher Deeney, John Porter, Johann Seaman (all 9573), Tom Sanford (9531), Roberta Hanes (contractor in 9342), Keith Matzen, Melissa Douglas, George Allshouse (all 9571), Bill Stygar, Gordon Chandler (both 9577), and Barry Marder (9541). Saturn is operated by "many highly motivated people" in Art Sharpe's Saturn Operations Dept. 9342, says Jim.

"The recent data make us think that maybe we can go higher on PBFA II. Our codes tell us we could get to 150 terawatts."



Sandia California News



ORIGINAL "56ers" —These Sandia pioneers transferred out from Albuquerque to establish an "outpost" in Livermore in 1955-56. They were photographed at that time in a stairwell in their original barracks quarters at the "Rad Lab," across the street from present-day Sandia. Of that group, eight returned for the 40th anniversary. They include Gayle Cain, Vernon Field, Bill Little, Frank Murar, Joe Sladky, Lorena Schneider, Harvey Pouliot, and Bob Siglock. Past Sandia/California directors also present for the day were Hilton DeSelm, Leo Gutierrez, and Byron Murphey. (Photo from the Sandia Corporate Archives, courtesy Dept. 15102.)



BIRTHDAY CAKE — Cutting the 40th anniversary cake during the noontime social on the Combustion Research Facility patio March 7 are, from left, retired California site VP Tom Cook, former California VP and now Sandia Executive VP John Crawford, President C. Paul Robinson, retired California VP Dick Claassen, and current California VP Tom Hunter.



STATE PROCLAMATION — State Assemblyman Richard Rainey (left) presents VP Tom Hunter with a state proclamation commending Sandia for its 40 years of service in California.



LAB TOURS — VIP guests were given tours of the Combustion Research Facility prior to the community meeting. Here David Chandler (8353) explains an experiment in the Chemical Dynamics Lab.

Sandia celebrates 40 years in California

By Nancy Garcia

California Reporter

On the patio of the Combustion Research Facility, which just the day before had celebrated its 15-year anniversary, employees observed Sandia/California's 40th anniversary on March 7 with cake, ice cream, balloons, and historical displays.

In the adjacent auditorium, a skit, songs, and reminiscences from early employees rounded out the midday celebration. Later that afternoon, Sandia President and Director C. Paul Robinson and California site VP Tom Hunter reviewed highlights of the current year for some 200 members of the staff, public, and special guests and offered predictions for the future.

Striking a theme of partnership, Tom said our "major and most immediate" partnering in California is with Lawrence Livermore National Laboratory. Indeed, distinguished visitors from the laboratory across the street included LLNL Director Bruce Tarter, Lab Executive Officer Ron Cochran, Deputy Director for Operations Bob Kuckuck, Deputy Director for Science and Technology Jeff Wadsworth, Associate Director for Lasers Mike Campbell, Acting Energy Associate Director Bob Schock, and Director Emeritus Edward Teller.

Regional recognition also came from the California State Legislature. Assemblyman Richard Rainey presented a proclamation honoring the site's 40th anniversary. Likewise, Vice Mayor Ayn Wieskamp from the City of Livermore presented a similar proclamation.

The impact of the site is seen not only through charitable giving (gifts and grants from the Lockheed Martin Foundation in California now total some \$30,000 annually), Tom said, but also through technical collaborations with such entities as the Bay Area Rapid Transit System and Kaiser Permanente.

Sandia spends more than \$150 million a year in California, where its payroll averages about \$50 million annually, Tom added.

Deputy Director John Crawford, vice president of the site until August 1995, lauded the laboratory's ability to capitalize on shifting opportunities.

"The place has gone through enormous transition and cycles in the last few years," John said. "What we can be proud of is an ability to go through major transition and come through a winner."

During his tenure in Livermore, for instance, Sandia/California obtained its first Cray supercomputer, which was moved to Albuquerque three years later. Employees turned that loss into a major strength in computer networking, John said.

Today, a prime example of Sandia's promising partnerships is a Virtual Laboratory Testbed in which industry can conduct R&D on high-speed data networks that link Livermore, Albuquerque, and Los Alamos, Tom said.

"There's uncertainty in the future," Tom added, "but there's also a challenge. It's certainly not without opportunity."

Paul echoed that view, predicting that "whatever the important problems are of the nation, that's our job."



TIME FOR LAUGHS — Sharing a joke during the 40th birthday skit in the auditorium are, from left, retired VP Tom Cook, emcee Jack Martinell (retired), and "Thunderchicken" Nick Wittmayer (8815).



HISTORY IN PHOTOS — Sandia/California archivist Vicky Kulsic (8950) produced a display of historic photos covering all four decades of the site's history. The display will remain in the 904 auditorium lobby for a while so more people can see it.

Photos by Lynda Hadley and Barry Schrader

'Crazy' states can be understood, deterred, professor says

Nonrational factors help shape strategic behavior

By Bill Murphy

Lab News Staff

If you think there are more "crazies" on the world stage than ever before, you're definitely right — and you're absolutely wrong. Stephen Rosen, a Harvard government professor and acting director of the John M. Olin Institute for Strategic Studies at Harvard, says there are, indeed, more "crazies" the US must deal with at the strategic level, but he qualifies that assessment by explaining that they may not be so crazy after all. Irrational, by our lights, maybe. But crazy? Not necessarily.

It's all a matter of understanding where they're coming from, Rosen says.

Rosen, who visited Sandia recently to present a colloquium on "The Nonrational Aspects of Strategic Behavior," says that in the post-Cold War world, the shortcomings in the traditional model for predicting strategic behavior have become increasingly apparent.

The prevailing model used by strategic thinkers and policy makers has its roots in the immediate post-World War II era, Rosen explains, when economists at the RAND Corporation made strategic behavior a subject for formal study and analysis. These RANDians said people made strategic calculations based on a sort of cost/benefit analysis, the costs and benefits being essentially economic.

That model, Rosen says, "may never have been completely adequate to explain strategic behavior" but in dealing with the bipolar global strategic situation that prevailed during the Cold War, it worked well enough to be useful, even powerful.

"It may be the case, though, that the [economic] model is increasingly inappropriate for understanding the kinds of strategic issues that we are likely to face in the coming period," Rosen says.

During the Cold War, Rosen says, the superpowers were able to "sit on" their client states and allies, thus tempering the extremes of strategic behavior that might otherwise have manifested themselves. That has changed.

New actors enter world stage

"To put it very bluntly," Rosen says, "there is a sense now that there are a bunch of crazies out in the world. There are new actors — non-state actors, largely — we don't understand and whom we can't deter.

"The frequent but not logically necessary consequence of that observation is that: 'we can't understand them, we can't deter them, and therefore we have to kill them,' to put it very crudely; more subtly, 'we can't understand them, we can't deal with them, interact strategically with them in a significant way, we cannot deal with their intentions, we cannot deal with their minds, therefore, we have to deal with their capabilities, either by offensive action, defensive action, or some combination thereof.'"

Two factors contribute to this very real

sense that there are more "crazies" than there used to be: First, the collapse of the already mentioned superpower constraint system and second, the diffusion of technological capability, which has expanded the range and character of actors with whom we have to deal at the strategic level.

"We no longer have to deal simply with state bureaucracies that have routines more or less comprehensible and more or less guided by our notions of rationality," he says. "There is some greater likelihood now that among this set of new actors there will be those whose behavior we can't predict and we can't understand."

For example, Rosen says, economists assume that rational strategic behavior is driven by a desire to maximize individual benefits. "But we know that people don't always do that," he says. As such, in predicting strategic behavior, "you must know the unit whose benefit is being maximized." The "unit" may be the nation, it may be the family, it may be the kinship group, it may be some other element, but meaningful analysis must begin with an understanding of the unit.

Second, long-term deterrence won't work if the time horizon of your adversary is very short. Likewise, short-term deterrence is ineffectual in dealing with the challenges posed by an adversary whose time horizon stretches out into the dim future.

Biological, social factors significant

A growing body of research data, Rosen says, suggests that biological and social factors dispose an individual to "pre-rationally" filter out some kinds of information and assimilate other kinds. If a strategic analyst doesn't understand which streams of information are relevant to an adversary, it is unlikely that the adversary's behavior can be predicted, controlled, or deterred, Rosen says.

Recognition of considerations of envy and social status weigh significantly in strategic calculations, Rosen says. Some societies — Rosen uses the examples of Wilhelmine Germany and modern China — are extremely dominated by status considerations, to the extent that these considerations may supersede other factors such as economic utility. The strategic thinker, Rosen says, must incorporate this factor into calculations of behavior management, manipulation, and deterrence.

Sandia News Briefs

Sandians' paper on rad-hard electronics wins award

Dan Fleetwood (1332), Marty Shaneyfelt (1332), Bill Warren (1845), Jim Schwank (1332), and Peter Winokur (1332) have received the Outstanding Paper Award for the 1995 Hardened Electronics and Radiation Technology Conference for their paper titled "Charge Trapping in Field Oxides." The paper compares charge transport and trapping properties among several types of MOS isolation oxides, and provides insights into the defects that control the radiation response of hardened-field oxide structures. The hardened-field oxide is the most important feature that differentiates commercial electronics from rad-hard electronics technology.

Visual Communications wins recognition at video festival

Two of Visual Communications Dept. 12614's video productions achieved finalist status and were awarded certificates of recognition in the 38th annual New York Video Festival. The festival is an international competition designed to recognize and reward outstanding achievements in video production. The 1995 competition attracted more than 3,000 entrants from 38 countries. "Robotic Welding of Multi-Purpose Canisters" was a finalist in the "energy" category. A video about the multi-dimensional, user-oriented synthetic environment, a virtual reality software system developed at Sandia, was a finalist in the "computer science" category.

Send potential Sandia News Briefs to Lab News, Dept. 12622, MS 0165, fax 844-0645.

Colloquium series brings strategic thinkers to Sandia

Stephen Rosen's "Nonrational Aspects of Strategic Behavior" presentation was the first in a promised series of colloquia on strategic studies issues sponsored by National Security Programs Division 5000.

Division VP Roger Hagengruber, in introducing Rosen, noted that during the 1970s and early 1980s, Sandians frequently interacted with strategic thinkers from academia.

"The laboratories [then] were a hotbed where people would discuss strategic matters, the future of nuclear weapons, the future of war, the future of the military," Roger said. "We went through a period in the 1980s when there were many things for us to do . . . but somehow we lost some of the connectivity we had and the flow of speakers that we had back in the 1970s."

The new colloquium series, Roger noted, represents an effort on the part of the strategic studies organizations both at Livermore and Albuquerque to find ways to increase the exposure of the staff and management at the laboratories to the thought processes that are guiding high-level discussions of national policy and national security.

The bottom line, then, Rosen says, is that "crazy" states, states that behave with actions that are hard for us to understand on the basis of standard models of rationality, are not inexplicable. They are not impossible to understand if you begin to incorporate into your models a number of factors in addition to straightforward calculations of economic utility.

"Crazy states don't have to be killed — it is possible to deter them," says Rosen. "It is possible, but deterrence policies must rest on a better understanding of the parameters within which these groups calculate the streams of information upon which they base their calculations."

Find it on-line: Reapplication hits the Internal Web

DOE-wide 'wishbook' saves Sandians (and taxpayers) money

By Philip Higgs

Lab News Intern

Psst . . . Hey pal. Need a new computer? How about a nice cellular phone? A digital oscilloscope? Chances are you can find one in Reapplication, and beginning May 1 you don't even have to leave your office to look for it. Through the services of WebCo, Reapplication Dept. 7617 will soon offer "Excess Property Express" — a searchable on-line database of used, sometimes new, and always free Sandia and DOE equipment — on Sandia's Internal Web.

Yep, that's right — free. Everything in Reapplication was already paid for at one time or

another, and now it's just taking up space.

Thousands of items are available for the taking from both Sandia/New Mexico and Sandia/California. "The problem is," says Joy Ash of Dept. 7617, "nobody knows just how much stuff we've got."

But who has time to go shopping at the Reapplication warehouse? It's easier to fill out a form and order a new item than it is to get in the car or on the bike, head over to "Re-apps," and stroll through the aisles hoping to find something.

Homepage Shopping Network

That is, it was. With the new Web page, designed by Joy, Carol Jones, and Jennie Negin (both of WebCo), digging through Reapplication is a point-and-click snap. Numerous entry fields enable a shopper to specify exactly what he or she is looking for using generic descriptions. Searching the entire database takes seconds.

Type in "computer," and all available items in both New Mexico and California are listed. Type in "Sun Microsystems," and all computers made by Sun will appear. You can also specify the model number and location, as well as in what condition ("New," "Used Good," "Used Fixed") the item should be.

After minimal paperwork, it's yours.

"Think of it as a 'wishbook,' like a catalog from Sears or JC Penney. If you need equipment but don't have the money, that shouldn't stop you."

From the Reapplication Web page you can go directly to the DOE-wide Reportable Excess Automated Property System (REAPS) Express Web page, which lists excess items from around the world. Any of the equipment purchased by DOE at any national lab, contractor site, or facility is fair game for Sandians.

"Think of it as a 'wishbook,' like a catalog from Sears or JC Penney," says Joy. "If you need equipment but don't have the money, that shouldn't stop you."

Nor should it stop you if you don't really need anything. "Just look around, you might find something you can use," she says. "There's nothing stopping you from getting something you just want."

As any Sandian who's filed a Purchase Requisition knows, before Sandia can make a purchase of over

\$5,000, DOE regulations require that excess property must be checked for a similar item. The reasoning is simple: Why buy a new lawn mower when you've got one in the garage?

What used to be a long and involved process now takes a few minutes. Before Excess Property Express, someone with a Laboratory Information Account (LIS) computer account (usually someone in Reapplication) would have to search a complicated, user-unfriendly database for excess items. "It took forever," says Joy, "and it was a pain to use."

Anyone with Internal Web access can use Excess Property Express, but even those with-



NOT YOUR EVERYDAY STORAGE SHED — Ralph Waddles (7617) checks computer inventory against records in the Reapplication warehouse, Bldg. 957. "We used to have so much stuff, things were lying on the floor," says Ralph. "But people are getting the idea that they can come to us for equipment." Reapplication's Internal Web page, with a listing of all items available to Sandians, will be on-line by May 1.

out Web access can benefit from the new system by calling Reapplication and requesting a search.

A money-saving step

A "Trading Post" Web site is also in the works that will enable users to bypass Reapplication altogether.

The new site will take the form of a bulletin board: After you've purchased a new computer, for example, you post a message to the Web site that advertises your old computer and lists your location and telephone number. That way someone can read the message and call you up to ask about your old computer. After someone decides it's for them (and after filling out a few simple forms), it's theirs.

"The savings in eliminating even some of the pick-up requests would be incalculable," Joy says. "Purchase Requisitions wouldn't have to be processed, pick-up times would be sped up, less labor would be involved, less landfill space would be used, and on and on.

"Someone could duplicate a laboratory and spend a fraction of the original cost with just a little bit of research, research that is now a hundred times easier."

The Web site will be made officially available by May 1 at <http://www-irn.sandia.gov/cgi-bin/templates/template_reap.sh>, through Dept. 7000's Internal Web site, or by going to "Property" after hitting the "Applications" button on the Internal Web home page.

"If part of our job is to be good stewards of taxpayer money, this new Web catalog is definitely a positive step," says Joy.

Do you know where your property is?

It's Property Awareness Week, and the folks involved full-time with managing and tracking Sandia's property want to encourage all Sandians to be aware of their individual responsibilities in this area.

"We are, after all, the stalwart guardians of each and every item we use in our day-to-day operations, from a lowly pencil to the awesome particle beam accelerator," says Barbara Hoffman, Manager of Property and Packaging/Transportation Programs Dept. 7612.

She and her colleagues hope each Sandian will focus some attention this week on personal and organizational accountability for all material entrusted to his or her care.

They suggest asking seven simple questions:

- What property has been assigned to me or my organization?
- When was it last inventoried?
- Is it still necessary to your organization?
- Where is it?
- What is its condition?
- Is it properly stored and secured?
- Are appropriate records complete and up to date?

Mileposts

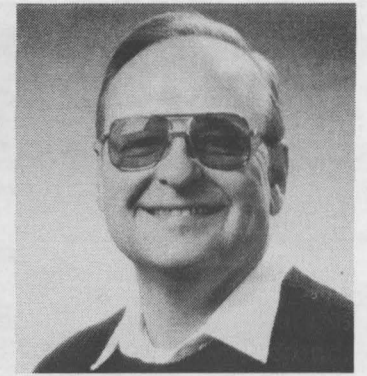
March 1996



Lyle Kruse 25
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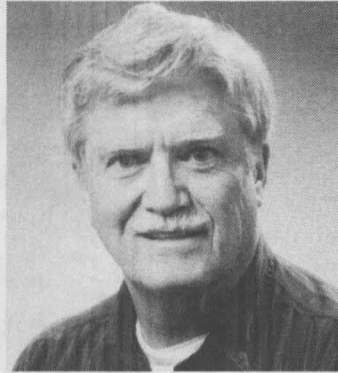
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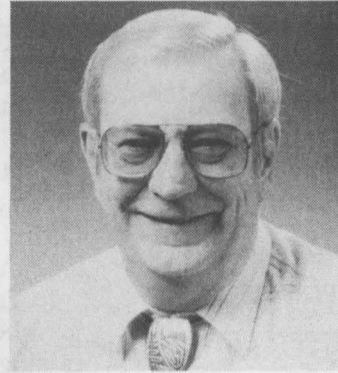
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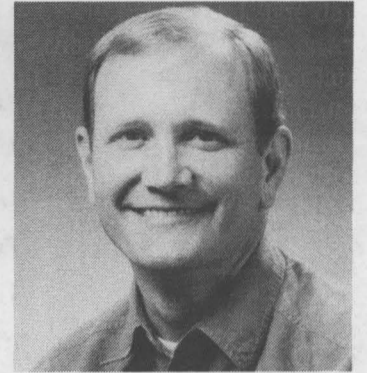
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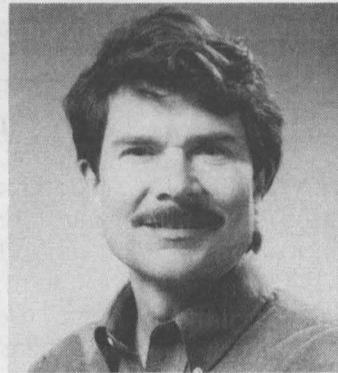
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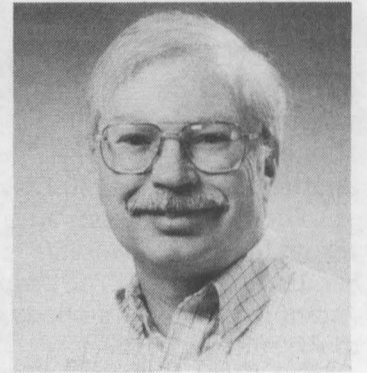
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Kyle White 20
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Bruce Bainbridge 15
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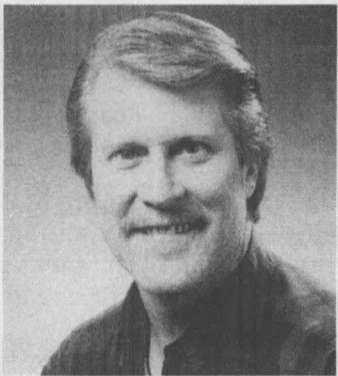
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Kent Biringer 20
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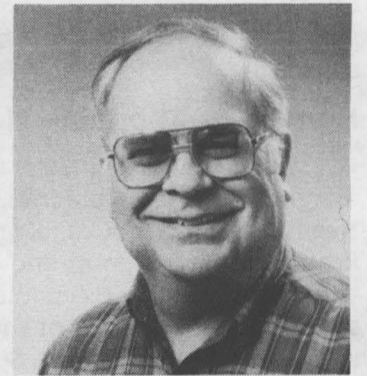
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Steve Sanderson 20
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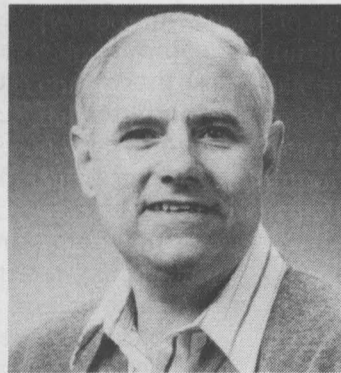
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Conrad Lucero 20
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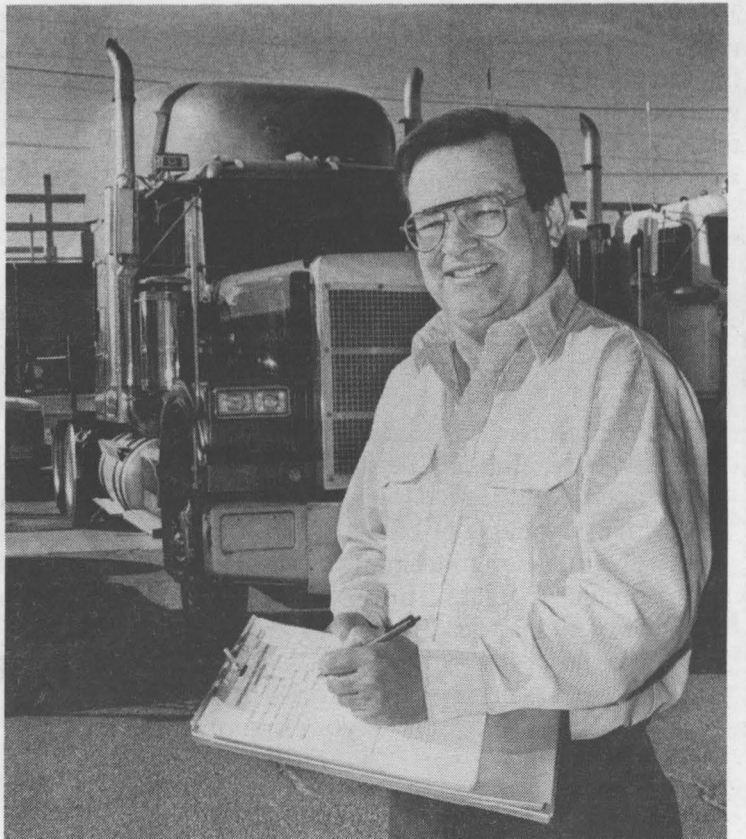
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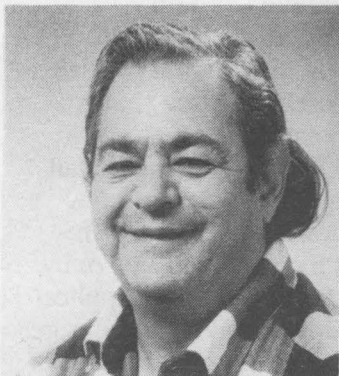
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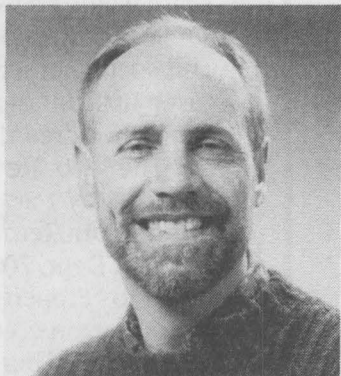
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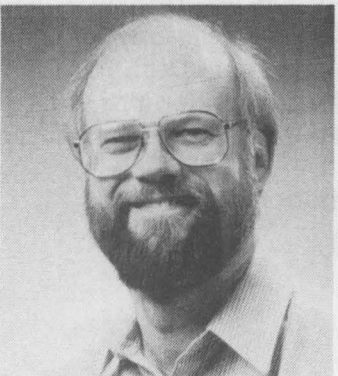
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5513



Chuck Hurtado 20
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Doug Trump 20
6423



George Dulleck 20
1235

Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

MISCELLANEOUS

HEELER CROSS, 2 one-yr.-old dogs, free to good home. Creel, 262-1622, ask for Cathi.

BEDS: Simmons queen sofa, teak queen platform; couch: Krause Sofa Factory; \$150 ea.; all 3 for \$400. Gerstle, 821-1112.

MATCHING SLEEPER SOFA & loveseat, earth tones, \$125. Newcom, 293-5180.

GARDEN TRACTOR, 10 hp, Simplicity, six implements w/8-hp, 36-in. tiller & trailer, \$3,500. Miller, 299-6067.

TWIN BED, Sealy Posturpedic, firm box spring & mattress, excellent condition, rugged frame, \$80. Rockett, 298-2589.

FREESTANDING BALLET BARRE, w/2 adjustable 5-ft. long barres, \$100 OBO. Hamilton, 271-8643.

BALL PYTHON, approx. 3 ft. long, w/damaged cage, \$65. Courtney, 296-3459.

TWIN-SIZE BED, extra-length, complete. \$50; Garrard Model 728 record changer, \$25. Stearns, 298-0444.

PUPS, Labrador Retrievers, black, AKC, Field/Bench champion bloodlines, hips/eyes guaranteed, \$500. Calloway, 292-5959.

HAMSTER, Teddy Bear breed, female, 4 months, nice cage, bedding, food, accessories, books. Braithwaite, 822-1998.

WROUGHT-IRON FENCE, white, 4-ft. high, 60-ft. long, two 3-ft. gates, \$300. Slosarik, 856-7055.

LEATHER COAT, petite size, excellent condition, no reasonable offer refused. Babcock, 299-3121.

COMPUTER SEWING MACHINE, Bernina 1130, complete w/accessories, instruction manuals, excellent condition, \$800. Marrs, 821-5144.

COMPUTER, 386DX-33, w/coprocessor, 8MB RAM, 200MB HD, VGA color monitor, Windows 3.1 software, \$500. Smith, 243-0714.

PICTURE POSTCARDS, for collector, free, 4-in. high pile, many not used, no stamps. Bazar, 898-1467.

TVs: 19-in. color, \$65; 12-in. B/W, \$30; both excellent condition, make offer. Dailey, 299-2284.

STAIR-STEPPER, Tunturi-401, like new, \$250; fiberglass canoe, 19-ft., good condition, \$300; best offers considered. Chavez, 898-4475.

STEREO EQUIPMENT, Realistic, tower speakers, \$80/pair, 12- & 5-band equalizers, \$45/\$20; turntable, \$20. Harrington, 292-1458.

DAY BED, \$200; Citizen 120D printer, \$35; Apple Image Writer II printer, \$75. Harris, 822-0236.

TWO SCUBA BUOYANCY COMPENSATORS, medium to large size, excellent condition, \$75 ea. Mead, 869-6124.

BUNK BED & more, pine bunk bed frame, \$175; matching student desk, \$50; bunk board, \$15. Jones, 899-0642.

PORTABLE SEWING MACHINE, \$50; octagonal coffee table, black slate, removable top, hidden casters, 38-in. depth, \$150. Murphy, 892-0288.

KIRBY GX VACUUM, w/shampooer & attachments, '96 model, used 2 months, paid \$1,800, asking \$1,200 OBO. Perez, 471-4286.

SPRINKLER TIMER, Lawn Genie, 6-station, digital, battery backup, easily programmed, 3 years old, like new, \$15. Meeke, 828-9825.

EARLY AMERICAN LAMP, 40-in. tall, sturdy, 3-way, w/built-in nightlite, \$25 OBO; floor lamp, brass lamp. Dixon, 298-5617.

BABY SWING, battery-operated, like new, \$50; umbrella stroller, \$12; both are Graco brand. Harrington, 899-1277.

NORDICTRAK PRO, w/workout computer & adjustable incline, still under warranty, paid \$634, asking \$300. Swenson, 275-7744.

ULTRASONIC HUMIDIFIER, Holmes HM-324, used 1 season, new condition, in box, \$30. Miranda, 293-8644.

MESA AIRLINE CREDIT COUPONS, \$182 transferrable, valid until 6/26/96, asking \$150. Gibson, 898-3529.

CLEAN FILL DIRT, you haul; used 2-ft railroad ties; jigsaw puzzles, 500-1,000 pieces each; all free. Lunsford, 299-5187.

STAIR STEPPER, Turntec; Yakima spare tire bike rack; Marcy sit-up bench; softball equipment; Fender bass. Gunckel, 831-6719.

BLACKHOLE BEARINGS, \$40; BMX, \$20; 3 drumheads, \$30; Kotto hockey stick, brand new, \$12. Bordlemay, 883-4926.

DUAL CASSETTE & CD PLAYER, Sony, AM/FM, excellent condition, \$80; Sega Genesis & four games, \$100. Anderson, 897-2772.

ENGAGEMENT RING, 7 diamonds in 14K gold band, total 1.27 carats, center stone 0.75 carats, appraised \$4,495, asking \$2,700. Kuhlman, 271-5870.

BENTWOOD ROCKER, oak, from about 1910, museum-quality design, very comfortable, \$400. Dybwad, 296-9047.

IGUANA, healthy, friendly, 2 yrs. old, w/50 gal. aquarium & accessories, \$150 OBO. Santana, 294-0536, ask for Jolene.

TONNEAU COVER, new, for 8 ft. pick-up bed, paid \$300, asking \$200. Wright, 856-6923.

LITTLE TYKES: desk & chair, \$30; easel & chair, \$30; doll house & accessories, \$40. Baca, 867-5402.

SEWING MACHINE, replica of Singer style, foot pedal, new, never used, in 4-drawer cabinet, \$75. Golightly, 823-2568.

TOSHIBA COLOR TV, 19-in., PAL/SECAM/NTSC, \$50; power screwdriver & drill, \$5 ea.; car stereo amp, \$5; PC power supply, \$10. Schiller, 856-0744.

DRYER, electric, almond, runs fine, \$50; vacuum cleaner, \$30; two 6' bookcases, unfinished particle board, like new, \$15 ea. Filter, 823-1232.

SEWING MACHINE, Singer Model 758, w/solid wood cabinet, excellent condition, \$375. Letz, 293-4525.

DEMCO TOW DOLLY, w/spare attached to dolly, excellent condition, used 5 yrs., paid \$1,400 new, asking \$700. Rael, 884-4778.

BRITANNICA ENCYCLOPEDIAS & Great Books, plus bookcase, will sell complete or separate, over 60 books, \$1,000. Honeycutt, 291-0230.

SOFABED, 70-in., \$75; couch, 54-in., \$40; scroll saw, 14-in., \$50; storm door, \$20. Roberts, 293-3107.

TWO SEATS, w/seal belts attached, maroon upholstery, bolt to van or covered truck bed, \$50. Schreiner, 266-6020.

TENT, dome-style, w/canopy, nylon, seam-sealed, roomy, \$60 OBO; Therm-a-rest pad, 3/4-length, \$25. Branstetter, 292-5978.

HEATHKIT 3400 MICROPROCESSOR TRAINER, \$40 OBO; IBM electric typewriter, \$30. Zirzow, 281-9896.

WOMAN'S WATCH, quartz movement, "Noah's Ark" set w/marquise stones, very unique, worn three times. Wilson, 293-2228.

ELECTRIC GUITAR, Yamaha 1221M Pacifica, w/Floyd Rose, DiMarzio pickups, w/case, list \$1,200, asking \$425. Cerutti, 292-0186.

STAIR CLIMBER, adjustable resistance, digital display, \$30. Nicolaysen, 275-9657.

FIVE-BURNER ELECTRIC COOKTOP, (3 burners functional), w/matching range hood, gold; free, plywood, 5 sheets, 8' x 4'. Stanton, 323-0811.

GE ELECTRIC RANGE, \$165; couch, 8 ft., green, \$75; car-top carrier, \$55; baby Easter bunnies, \$10. Parr, 837-1719.

KAWAI SESSION TRAINER, Model GB-2, plays programmable chord progressions, \$250. Banas, 265-0924.

KING TROMBONE, excellent condition, w/case, \$150; Bundy clarinet, excellent condition, \$125. Aragon, 888-3473.

DEADLINE: Friday noon before week of publication unless changed by holiday. MAIL to Dept. 12622, 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). Questions? Call Nancy on 844-7522. Due to space constraints, ads will be printed on a first-come, first-served 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.

CONTEMPORARY DINING SET, brass/glass table w/4 blue velvet chairs, perfect condition, \$300; china cabinet, \$75. Harrison, 897-0658.

COUCH, full, 8-ft., beige w/autumn colors, matching easy chair & ottoman, \$200/all 3. Cowman, 281-3478.

TWO STORM/SCREEN DOORS, & hardware, for 32-in. opening, cost \$110 ea. new, asking \$40 ea. Harrison, 821-9099.

ELECTRIC RANGE, self-cleaning oven, \$150; Vitamaster treadmill, \$100; 2 queen headboards, oak, metal, \$50. Sanchez, 898-9598.

TODAY'S KIDS PLAYLAND, four open, two activity panels, easy assembly, compact storage, paid \$100, asking \$45. Hutchins, 856-3361.

TRANSPORTATION

'94 DODGE INTREPID ES, 14K miles, well-maintained, all options, finest around, below book. Gonzales, 299-3491.

'89 CHEV. CORSICA, 103K miles, front-wheel drive, 4-dr., 5-sp., needs paint, good car, \$1,700. Twyeffort, 891-0707.

'94 THUNDERBIRD, 15K miles, V6, AT, leather, loaded, factory warranty, \$11,900 OBO. Swahlan, 292-3598.

'70 VW BUS, paid \$2,000, invested \$1,200, will sell for \$2,200 OBO, trades considered. Moore, 281-2480.

'88 TOYOTA CAMRY WAGON DX, 5-sp., AC, power options, looks/runs great, below book, \$4,400. Blejwas, 294-2057.

'79 HONDA 90 MOTORCYCLE, runs good, excellent condition, low miles, \$400. Cordes, 299-0511.

'81 CHEV. BLAZER, 4x4, 305 V8, AT, AC, original owner, very nice, \$3,950. Washburn, 275-3751.

'90 ECLIPSE, 5-sp., all power, AC, CD & cassette, excellent condition, must sell, \$9,200 firm. Garner, 271-4671.

'95 OLDS CONVERTIBLE, Cutlass Supreme, AT, PS, ABS, dual air bags, many extras, 5K miles, \$24,300. Lohr, 821-1043.

'88 PLYMOUTH VOYAGER LE, FWD, V6, LX trim, brown, 8-PAX, 57K miles, good to excellent condition, maintenance logged, \$8,500. Griffiee, 296-8129.

'83 BMW 320i, 2-dr., standard, black tinted windows, excellent condition, \$3,800 OBO. Trujillo, 271-6984.

'90 PONTIAC TRANS AM, white, 16K miles, excellent condition, 305 V8, AT, AC, stereo, NADA retail, \$12,100 OBO. Berg, 898-2100.

'90 DODGE D-250, 3/4-ton, 4x4, 360ci, 4-sp., AC, AM/FM cassette, all service records, 84K miles, excellent condition, \$8,500 OBO. Szklarz, 292-3995.

'92 STARCRAFT CONVERSION VAN, 3/4 Chev. chassis, super deluxe executive pkg., V8, brown, leather interior, \$15,500. Bivens, 892-5685, evenings.

'29-'30 FORD MODEL "A," antique, five-window coupe, good mechanical condition, \$3,000. Hardin, 821-6186, for details.

'92 CHEV. CONVERSION VAN, AC, AM/FM, queen bench, 4 captain chairs, 98,700 miles, priced under book. Shumway, 865-8881.

'91 BERETTA, V6, AM/FM cassette, tinted windows, airbag, AC, AT, nearly new tires, excellent condition, \$7,000. LaFleur, 269-0924.

'81 CHEV CONVERSION VAN, rebuilt 350, dual AC, captain chairs, fold-out bed, 115K miles, clean, \$3,995. Black, 281-9016.

'85 HONDA CRX-Si, red, 5-sp., alloy wheels, AC, CD player, sunroof, tinted windows, good tires, new clutch, \$3,200. Klein, 298-8252.

'80 CADILLAC SEVILLE, 4D, loaded, leather interior, low miles, diesel, \$1,200 OBO. Moreno, 844-4259.

'87 CADILLAC CIMARRON, 4D, V6, 83K miles, 4 aluminum 7-lug 15x7 American Racing Outlaw II wheels, w/center caps. Hanson, 299-6421 or 275-9514.

'94 MERCURY SABLE GS, 3.8i, V6, fully loaded, all power, 31K miles, excellent condition, \$12,950. Hart, 292-5110.

'91 TOYOTA COROLLA DX, 4-dr., high mileage, impeccable, repair records available, \$7,000 firm. Dingman, 298-5800, leave message.

'90 HONDA ACCORD LX, 2-dr. coupe, 5-sp., AM/FM cassette, AC, cruise, burgundy, excellent condition, original owner, 73K miles, \$7,900. Hassan, 822-9544.

'85 CADILLAC FLEETWOOD BROUGHAM, white, burgundy leather, excellent condition, 90K miles, \$3,700. Weirick, 298-2153.

'88 HONDA CIVIC, 4-dr., 5-sp., AC, tint, rear-window defogger, mint condition. Garcia, 343-8207.

'89 TAURUS LX, loaded, extra clean & nice, new paint, tires, brakes, tune-up, average miles, \$5,500 OBO. Garcia, 293-3937.

'77 DATSUN 280Z, 5-sp., new tires, mags, new battery, alternator, starter, \$1,500 OBO. Westfall, 884-8701.

'83 VOLVO 240DL, station wagon, AT, AC, PS, PB, 115K miles, good condition, 3rd owner, \$2,850. Clevenger, 888-0209.

RECREATIONAL

TRAVEL TRAILER, 24-ft., sleeps 4, fridge, gas cooktop & oven, microwave oven, \$3,000 OBO. McCord, 505-838-0555.

'85 ROAD RANGER 226 TRAVEL TRAILER, self-contained, AC, extras, good condition, \$6,500. Malpas, 294-2667.

'89 FIFTH-WHEEL KIT, 28-ft., standup bedroom, rear kitchen, AC, excellent condition, \$12,000. Hinds, 869-2191.

FISHING/SKI BOAT, 18-ft. Browning, fiberglass, tri-hull, 6 cyl. Volvo I/O, new interior, Vanson trailer; lots of extras; \$4,750. Hunt, 858-1927.

WOMAN'S MOUNTAIN BIKE, 26-in., Huffy, 10-sp., excellent condition, nice, only \$80. Macias, 242-3049.

'79 MOTORHOME, 23-ft., low mileage, 350 engine, roof air, sleeps 6, rear bath, GMC chassis, \$7,950. Sifford, 869-3982.

CABOVER CAMPER, Mitchell, 8-ft., w/stove/oven, double sink, electric water pump, icebox, port-a-potty, 4-corner jack, consider trades, \$850. Martin, 296-8154.

MAN'S 12-SPD. RACING BIKE, Schwinn World Sport, good condition. Coconelli, 286-9213.

GIRL'S BIKES: 20-in. Schwinn, 5-sp., \$50; bike, 20-in. General, \$50. Rector, 286-1217.

OVERHEAD CAMPER, 9-ft., w/jacks, \$550. Raines, 344-7821.

SAILBOAT, 16-ft., Chrysler Man-O-War, cat-rigged, sail excellent condition, boom-vang, new spare tire, fast/fun boat for 1-2 crew, \$900 OBO. Edmund, 881-7974.

REAL ESTATE

CUSTOM HOME, beautiful modern pueblo, 2,960 sq. ft., 2 yrs. old, Rio Grande Compound, borders Nature Center & bosque. Koehler, 344-7889.

4-BDR. HOME, 1,850 sq. ft., 1-3/4 baths, 2 living areas, fireplace, NE area, 6 minutes to Eubank gate, \$117,900. Winfield, 275-3514.

3-BDR. RETIREMENT/SUMMER HOME, golf course, near national forest, wilderness, 1-3/4 baths, DuBois, Wyo., \$89,000. Patterson, 307-455-2010.

3-BDR. HOME, 1,600 sq. ft., 2 story, 2-1/2 baths, 2-car garage, kitchen recently updated, remodeling home, \$135,000. Barnette, 292-5186.

WANTED

CAROUSEL SLIDE PROJECTOR, Kodak type; "Kimbo" board game; working VGA computer monitor. Spears, 266-9782.

PLAY-GYM, w/slide, sand box w/cover; Fisher Price/LittleTykes-style, age 2-6. Barnum, 856-5602.

HAY WANTED, old, molded, or bad. Greer, 281-4688.

DRUMMER, for working blues, classic R&R, jazz band, must have own equipment. Buttz, 822-1448.

CARETAKERS, retired couple to live in ranch home, 35 miles west of Conchas Lake. Causey, 881-7534.

SINGER SEWING MACHINE, featherweight, w/case. Carpenter, 256-0614.

MG "B" 3-MAIN ENGINE, Triumph Spitfire, for restoration. Crafts, 831-5234.

REUNION, Sandia High, classes of '59-'62, join us for fun & visit old friends. Shoaf, 296-6166.

EXHIBITORS, "Cherished Creations" arts & crafts show, May 3-5, State Fairgrounds, Lujan Bldg., 10x10 spaces. Self, 296-4137.

KODAK CAROUSEL SLIDE TRAYS, 140 preferred, used, will take 80, reasonable. Berry, 898-1400, leave message.

BABY STROLLER, double-tandem, good condition. Smith, 256-0562.

MOVING BOXES, miscellaneous sizes, we will pick up. Horton, 266-4233.

BASKETBALL HOOP, w/backboard & pole, good condition. Aurand, 281-4027.

METAL DETECTOR; .22 Remington pump rifle, small outboard, shell tumbler; XR100 motorcycle. Plummer, 823-1619.

ROMAN CATHOLIC MISSAL, '62 or earlier, Latin/English. Kubas, 877-1026.

LOST & FOUND

FOUND: Prescription glasses, tortoise shell frame, woman's-style, parking lot north of Bldg. 833, on 3/12. Weber, 268-1195 or 844-5476.

SHARE-A-RIDE

CARPOOL, from Belen area to Area I, working compressed workweek (7:00-4:30). Mendoza, 864-6279 or 844-6444.



RATS! New Mexico kids find fun solving problems at day-long fest

By Terry MacDonald

WIPP Site Operations Dept. 6743

The Southeastern New Mexico Educational Resource Center recently sponsored the third annual Realistic Applied Technology Symposium, affectionately known as RATS 95/96, at Loving High School in Loving, N.M. Cosponsors included the DOE Carlsbad Area Office, the Sandia Carlsbad Office, Westinghouse Waste Isolation Division, and businesses from the participating school districts. More than 165 people attended.

The participants in the day-long symposium were 112 seventh- and eighth-grade students from middle schools in Carlsbad, Lake Arthur, Loving, Lovington, Eunice, and Tatum. RATS 95/96 offered them a chance to work together as a school group, and on teams composed of individuals from each school, to solve real-life problems from the worlds of math and science.

The students worked in school groups on an environmental problem dealing with the study of local-area water sources and aquatic life. The environmental problem was selected by the participating schools several months earlier. Each school group monitored local water sources to gather information necessary to solve the problem. Each presented oral, video, and poster presentations of their findings at the symposium.

The students next joined their interschool teams to solve five of seven real-life math and science problems. The premise was to promote science and math as fun. The interschool team concept promoted cooperation among students from the different schools.

The most exciting and fun portion of RATS 95/96 involved three spontaneous problems. Each interschool team had to work and think as a unit to solve them. Observers found it amazing to see some of the structures students can build with marshmallows and spaghetti.



STICKY CHALLENGE — Students in one of the spontaneous problems of RATS 95/96 try to build a tower that must hold Ping-Pong balls using only spaghetti and marshmallows.

Parents were also involved. A panel of experts answered questions on peer pressure, communicating with children, and preparing students for college. Parents were also formed into teams and had to solve the same problems as the students. The parents' solutions were then compared with those of the students.

One highlight was a repeat visit by the guest of honor, Dr. Andrew Gaffney. Gaffney, a one-time Carlsbad resident, is Chief of Cardiology at Vanderbilt University and was a NASA space shuttle astronaut. He showed a brief film of his experiences aboard the space shuttle and remained at the symposium all day to answer the students' questions, encourage them, and serve as a spontaneous-problem judge.

Coronado Club

March 28 — Thursday bingo night. Card sales and buffet start at 5 p.m., early birds' bingo at 6:45 p.m.

April 4, 11, 18 — Thursday bingo night. Card sales and buffet start at 5 p.m., early birds' bingo at 6:45 p.m.

April 6 — Annual Easter Egg Hunt, 9 a.m.- noon; cartoons, 9-10 a.m.; Easter Egg hunt and games, 10 a.m.-noon. Free for children of Coronado Club members.

April 7 — Easter Sunday Brunch, 10 a.m.-4 p.m.; seating times are: 9-11 a.m.; noon-2 p.m.; 2:30-4 p.m. Seating is limited and reservations are required. \$8.95 for members, \$4.50 for children 3-12 years old, free for children under three.

April 12 — "Western Night" dinner/dance. \$6.95 all-you-can-eat buffet (\$7.95 for guests), 6-9 p.m. Music by Isleta Poorboys, 7-11 p.m.

April 19 — Family Night Out. \$5.95 all-you-can-eat buffet (\$7.95 for guests), \$3.50 for children 3-12 years old, free for children under three. Buffet served 6-9 p.m. Music by Together, 7-11 p.m.

Retiree deaths

Gerald Hurley (75)	7212.....	Feb. 8
Lonnie Skinner (90)	4513.....	Feb. 8
Dorothy Saiz (60)	10329.....	Feb. 8
Norman Colcleasure (71) ..	8513.....	Feb. 11
Glen Goodloe (80).....	9541.....	Feb. 14
Joyce Carden (64).....	7327.....	Feb. 16
Kurt Baars (86).....	4151.....	Feb. 20
James Hollon (83).....	4513.....	Feb. 21
John Shurter (79).....	3732.....	Feb. 22
Donald Quayle (76).....	1473.....	Feb. 22
Richard Hildner (88)	1711.....	Feb. 23
Harvey Thiermann (71)	2858.....	Feb. 24
Ralph Hamilton (72)	3435.....	Feb. 26
Grace Matuska (84)	8252.....	Feb. 27

National Atomic Museum sponsors Trinity Site tour April 6

The National Atomic Museum is sponsoring a tour of the Trinity Site, where the first atomic bomb was detonated, on Saturday, April 6. The historic 21-kiloton explosion on July 16, 1945, marked the end of the Manhattan Project and the beginning of the Atomic Age.

The site, open to the public twice a year, is located on White Sands Missile Range approximately 130 miles south of Albuquerque. Attractions include a small monument and tower remnants designating "ground zero," remains of Jumbo, an enclosure for viewing Trinitite, and the McDonald ranch house.

Tour tickets are \$25 per person, available at the National Atomic Museum Store. The ticket price includes bus transportation to and from the site and a guided tour.

On the day of the tour, buses depart from the Museum promptly at 6:30 a.m. and should return by approximately 4 p.m. Cameras are allowed at the Trinity Site, but their use is prohibited anywhere else on White Sands Missile Range.

Profits from ticket sales will be used to help further the educational goals of the National Atomic Museum, now managed by Sandia.

For more information, call the Museum Store at 284-3242.

Favorite Old Photo



This old photograph is my favorite because it shows both my grandfather, Lynn Stokes (the gentleman in the back row), and my grandmother, Juanita Skelly-Stokes (seated third from left, directly in front of him). The picture was taken in the spring of 1931, some months before their marriage in October 1931. The team had just won the Greene County, Missouri, softball championship. My grandfather, who was the coach, was then 30 and my grandmother was still in high school. They were married for more than 60 years when my grandfather passed away in November 1993.

— Jennifer L. Gonzales (9361)