

Challenge for Sandia: Creative Responses to Changing Environment

Continuing an annual tradition, the LAB NEWS recently interviewed President Al Narath and Executive Vice Presidents Orval Jones and Lee Bray on the current "State of the Labs." Here's what they said:

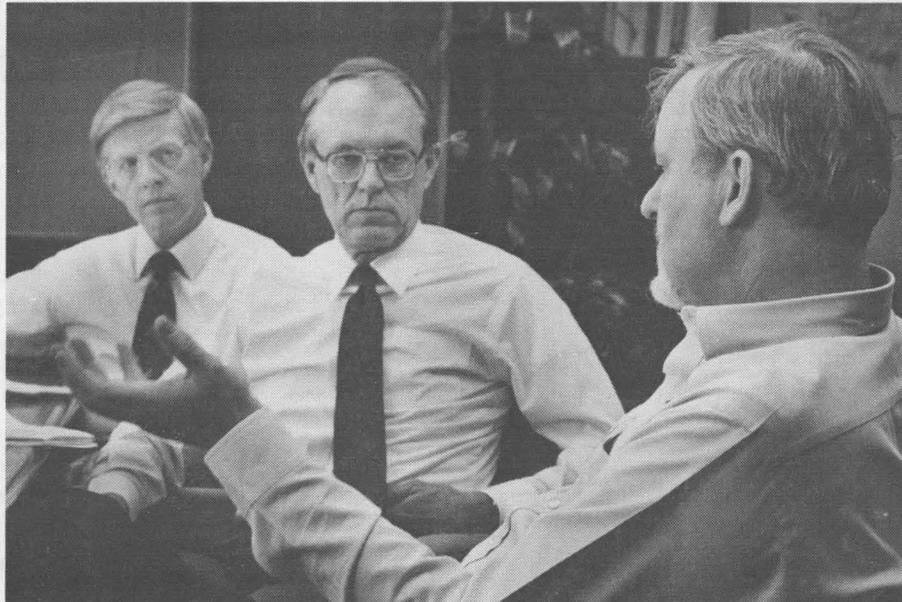
LN: For quite a while, we've all been talking about change, and we've been changing. Are we doing it fast enough and in the right direction?

Narath: Yes, we're moving in the right direction. I think we're going as fast as could be expected. Nobody thought that our strategic vision could be accomplished overnight. We knew we were in this for the long haul. Naturally, there have been some rough spots, but I'm generally satisfied with what I see happening. Some of the publicity about our change management effort made us uncomfortable, but even that had a benefit, by bringing home the need to do a better job of communicating the vision and involving employees at all levels.

If there's a disappointment, it's that I didn't expect the concept of empowerment to confuse so many people. We're asked, "What is the vision of the end state? What is empowerment?" That ques-

"There's no lack of nationally important problems where the Labs can make important contributions."

tion itself is a reflection of the old mode, as if we don't believe until we see it spelled out in great detail. Instead, we should all do more independent thinking, get more involved, feel more responsible,



LEE BRAY (Executive Vice President 20, left), Orval Jones (Executive Vice President 30, center), and Sandia President Al Narath discuss changes inside and outside Sandia.

and play a larger part in helping shape the future.

Bray: We are certainly changing, and one evidence of it to me is the movement of the Laboratories toward ES&H compliance, improvement, and excellence. It's a major effort, and I think it's going well. I'm encouraged by the questions I get linking ES&H and quality. People are thinking about the quality approach, and they're recognizing that because of the time constraint, we're moving faster on ES&H than we'd really like to from a quality process point of view. I'm glad Sandians are thinking of quality. Of course, schedule is one of the measures of quality, along with cost and performance. At least for a while, schedule will have high priority in the ES&H effort.

Change — particularly as it's reflected in

ES&H — is a massive effort that we've been able to get most Sandians solidly behind in a relatively short period. As time goes on, we'll have to demonstrate that we're agile, that we can shift gears, because we're not going to have a perfect blueprint of the future. So to the degree we can be agile, flexible, and responsive, and can muster forces in different directions as needed, I think we're going to be successful.

Jones: The change organization [Org. 5] is really a facilitator to help us achieve the three qualities that were introduced at Vision Day — leadership, basically a call to Sandia management and employees to measure up to the charge in our founding letter of "exceptional service in the national interest"; second, empowerment, which means to each of us, "You are the future — take charge within your boundaries"; and quality, which requires focusing on

the outside world, on our customers. Those three really are the big things, along with the ES&H "bootstrap" operation, where we're bringing ourselves up as quickly as we can. The purpose of the change activity is to help us move forward as quickly as possible.

LN: Looking toward next year — what do you conclude from President Bush's fiscal '92 budget proposal?

Narath: I don't see anything very startling. The President's budget certainly reflects the financial pressures that the federal government is under. It's consistent with our view that the weapon program may decline slightly over the next several years — no surprise there. And it's certainly con-

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**Retiring VP
Bob Peurifoy Recalls
Early Days at Sandia
— See Page Four**

Spence Reveals the 'Game Plan'

Tiger Team Leader Discusses Upcoming Visit

Dave Spence, leader of the ES&H Tiger Team that will begin its six-week appraisal of Sandia on April 15, describes himself as a "dirt under the fingernails" type mechanical engineer who won't be tied to his desk while at the Labs. "I intend to practice MBWA — management by walking around," he says.

Spence, assistant project manager of operations for the Department of Energy's Strategic Petroleum Reserve (SPR), is a man of varied interests, experiences, and expertise.

He was recently elected chairman of the Visiting Committee for Excellence in Education for the Aerospace and Mechanical Engineering School at the University of Oklahoma. Spence has served as a member of that committee at OU, his alma mater, since 1986.

While with NASA and Northrop Space Laboratories — from the early '60s to the late '70s — his publications included "Design and Qualification Test Requirements for Apollo Experiments," "Preliminary Feasibility Analysis of Outer Planet Atmospheric Entry Probes," and "Comet and Asteroid Rendezvous and Docking System Concepts."

He's also a disciple of quality expert W. Edwards Deming, whose work led Japanese industry into new principles of management and revolutionized their quality and productivity improvement programs.

During a recent get-acquainted visit to Sandia, Spence took time to chat

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SHARING KNOWLEDGE — Dan Alpert (6216) explains how a stretched-membrane solar reflector works to students Melanie Gude, Los Lunas High School, and John LaValley, St. Pius High School. Sandia was one of five organizations that provided exhibits at the New Mexico Regional Science Fair at the University of New Mexico March 15 and 16. For this demonstration, Dan is employing a model similar to much larger, dish-shaped collectors used at Sandia to collect and focus sunlight. Sandia's display was titled "Solar Thermal Technology — Using Sunlight to Generate Hot Water, Steam, and Electricity."

This & That

Window of Opportunity - Change has become a constant at the Labs, it's not going away, and it should be viewed as an opportunity rather than a threat. Those exact words aren't in this issue's State-of-the-Labs feature, but they reflect its essence. President Al Narath and Executive VPs Lee Bray and Orval Jones don't minimize the difficulties of the present, but they believe Sandia can adapt, thrive, and go on contributing to the nation's well-being. They also recognize - and deeply appreciate - the efforts of Sandia employees in a stressful time.

Thanks to Al, Orval, and Lee for taking time for the interview and for reviewing the manuscript, and to the other Sandians who cleared up questions or confirmed info. LAB NEWS assistant editor Charles Shirley was interviewer and writer; Ace Etheridge (3161) was co-interviewer.

* * *

Read On - If you're interested in more thought-provoking reading, check out the article "New Challenges for the National Labs" in the February issue of *Physics Today*. (The Tech Library has a copy.)

The article about "how the national labs can best achieve their new mission while retaining their old strengths" is based on a roundtable discussion conducted by *Physics Today* editors during an October 1990 American Institute of Physics meeting in Albuquerque. The discussion features six of the nation's top R&D administrators, including Gerry Yonas, Director of Laboratory Development 400; Los Alamos National Lab Director Sig Hecker; and Sol Buchsbaum, Senior VP, Technology Systems, AT&T Bell Labs. (Sol is a former Sandia research VP and current member of the Sandia Board.) The discussion, according to the introduction, was "often lively and occasionally contentious." Very interesting article. By the way, it includes some nice photos by LAB NEWS photographer Randy Montoya.

* * *

Exceptional Record Plus 14 - Fourteen years ago, recently retired Sandia Vice President Bob Peurifoy received a Distinguished Service Award from the Energy Research and Development Administration (ERDA), the predecessor agency to the Department of Energy. A key phrase from that award: ". . .an exceptional record of meeting critical deadlines within funding constraints and without sacrificing quality or system performance." Sandia President Al Narath says that phrase pretty much sums up Bob's entire Sandia career. "Bob's many contributions to nuclear weapon safety and reliability, in particular, have had a lasting effect on the nation's nuclear deterrence," says Al. For some highlights of Bob's career, see the article by Ken Frazier (3161) on page four.

* * *

Get Your Mug Over Here! - If you reserved a Sandia coffee mug, but haven't picked it up by next Friday, March 29, we're going to have to sell it to someone else. Everyone who reserved a mug should have been called by now. Pick 'em up in Bldg. 814, Rm. 1. Seven bucks each, cash or check.

* * *

Poorer, But Wiser, Now - If you read this column regularly, you know how very much I value my boss's advice, even though I don't always follow it. I'm learning, though. Not long ago, he said, "Son, never - I say never - play poker with a guy named Ace." I heard it, but didn't heed it.

•LP

Crime Stoppers, APS Next Topics for Community Focus



The impact of drugs on crime in the state will be discussed by New Mexico Crime Stoppers Commission Executive Director Kathy Baca at the next Community Focus lecture Monday, March 25, at noon in the Technology Transfer Center.

On Tuesday, April 2, Albuquerque Public Schools (APS) Superintendent Jack Bobroff and Albuquerque Teachers Federation President Don Whatley will be Community Focus speakers, also at noon in the TTC. They will talk about how the current restructuring movement in APS will affect Albuquerque parents and children.

Last May, Crime Stoppers and KOAT-TV conducted a two-hour "Operation Crackdown" broadcast, during which more than 800 narcotics-related Crime Stopper tips were received from throughout the state. More than 800 calls for drug rehabilitation information were received. Cocaine and marijuana were the two main drugs mentioned by callers.

After the broadcast, Baca commissioned an analytical study of the responses to get a better perspective on the state's drug problem. She will discuss the results.

A former police officer, Baca has also worked in the Bernalillo County District Attorney's office. Since joining Crime Stoppers, she has coordinated a statewide marijuana eradication task force that resulted in a 700 percent increase in destruction of marijuana crops.

At the April 2 lecture, Bobroff and Whatley will explain restructuring from the perspectives of the administration and the teachers union. Restructuring is a cooperative effort aimed at giving teachers and parents more involvement in local school decisions.

Both Bobroff and Whatley are former teachers. Bobroff has taught and been a principal at the elementary, middle, and high school levels in APS. His contract as APS Superintendent was recently extended by the APS board.

Whatley is serving his third consecutive term as president of the Albuquerque Teachers Federation, which represents more than 5,000 certified educators in APS. He has taught middle school in APS and in Texas.

The Community Focus lectures are coordinated by the Community Relations Division. For more information, call Al Stotts on 4-2282. ●

Congratulations

To Audrey and Jeff (2533) Sniegowski, a son, Colton Mikhail, Feb. 20.

To Teresa and Jake (5213) Deuel, a daughter, Daniela Marie, Feb. 22.

Retiree Deaths

Thomas E. Cook (72)Feb. 10
Thomas Banks Jr. (80)Feb. 16



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MORE THAN 50,000 hours of Stark Technical College students' time went into the fundraising, design, and construction necessary to create this solar car, which weighs about 800 pounds and is powered by a 20-horsepower motor. Output of the solar array, which can charge the car's batteries or provide direct drive power, is about 1,000 watts on sunny days, 400 under cloudy skies, and 100 on rainy days. The car, one of 32 solar cars competing in last summer's GM-sponsored "Sunrayce" from Orlando, Fla., to Warren, Mich., was on display at Sandia last week. More than 40 Sandians are graduates of Stark Technical College, which is in Canton, Ohio.

Course of Action Determined**Watkins Approves Sandia, Livermore's Response to Tiger Team Findings**

Secretary of Energy James Watkins has approved Sandia, Livermore's Corrective Action Plan that responds to the May 1990 DOE Tiger Team findings.

The 508-page document outlines the course of action Sandia and DOE will take to correct deficiencies in the areas of health and safety, management and organization, environment, and Occupational Safety and Health (OSHA).

Last May, the Tiger Team listed 286 findings in four general categories: 41 in environmental, 119 in safety and health, 112 dealing with OSHA regulations, and 14 in management and organization. Fourteen of the 286 were considered key findings, including three in environment, three in safety and health, two pertaining to OSHA, and six involving management.

In approving Sandia's response, Secretary Watkins commented: "At Sandia, none of the findings or concerns necessitated immediate cessation of any operations. Many of the corrective actions recommended by the Tiger Team have already been

"We'll have the programs and support to allow us to improve our ES&H performance on our jobs."

completed. We intend to proceed with these corrective actions as part of our efforts to re-establish full awareness and accountability for our responsibilities in health, safety, and the environment."

"The Secretary's comments indicate that the report was well received," says Dick Rohde, Manager of Sandia's Environment, Safety, and Health Dept. 8540. "This is due to the thousands of hours of work by many people at this site, as well as at the Kirtland Area Office, Albuquerque Operations Office, and Sandia, Albuquerque, which put a new ES&H management structure in place."

A Beginning, Not the End

Dick adds, "This is certainly not the end of our response to the Tiger Team findings; it's really the beginning. Our Action Plan details a number of activities that have to be completed to bring us into compliance with the findings, DOE orders, and federal and state regulations. The staff in ES&H support groups such as the ES&H Department, plant engineering, plant maintenance, medical services, training, packaging and transportation, security, and in some line organizations such as the Tritium Research Lab, will be directly involved in completing action plan activities.

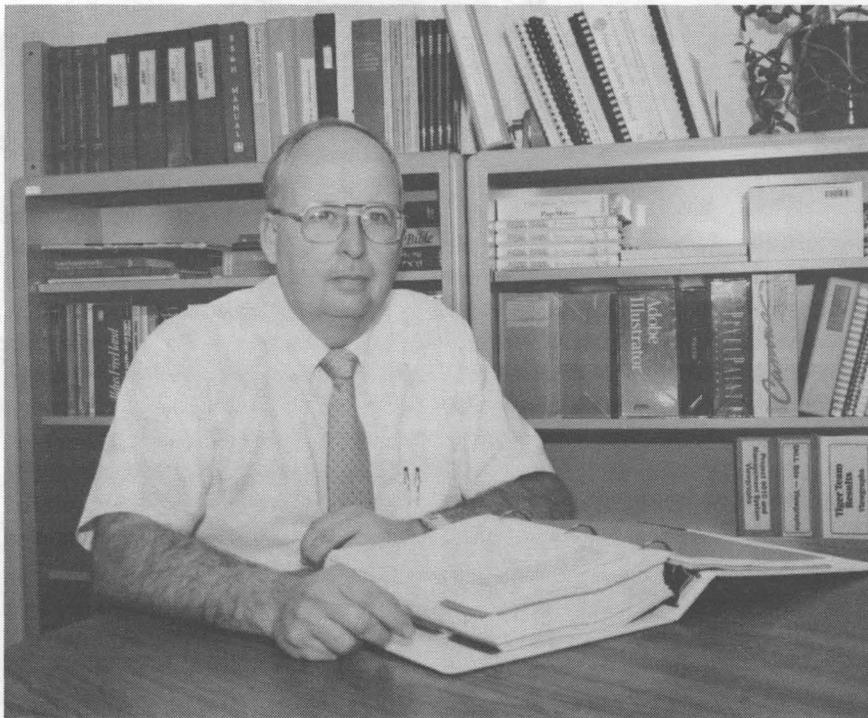
"The changes coming out of the Action Plan will affect all of us at Sandia, Livermore. We'll have the programs and support to allow us to improve our ES&H performance on our jobs."

Dick notes that many of the actions being put into place will be permanent changes, like the new management structure. Most of the compliance actions will be completed within four years.

Total Cost \$110 Million

The total estimated cost to implement the Action Plan through FY95 is \$110 million. This includes the salaries of all those involved in the process and management oversight from Albuquerque. The estimated budget for FY91 for corrective actions in Defense Programs at Sandia, Livermore is \$33.4 million; this year's Environmental Restoration and Waste Management costs are estimated at \$1 million. All of the planned actions for this fiscal year are being accommodated in the current budget.

In June 1989, Secretary Watkins announced a 10-point initiative to strengthen safety, environ-



LOOKING OVER the 508-page Corrective Action Plan to the Tiger Team Assessment of Sandia, Livermore is ES&H Dept. Manager Dick Rohde (8540).

mental protection, and waste management activities at all DOE facilities. In support of that plan, he established independent Tiger Teams to carry out onsite inspections in the areas of environment, safety, and health.

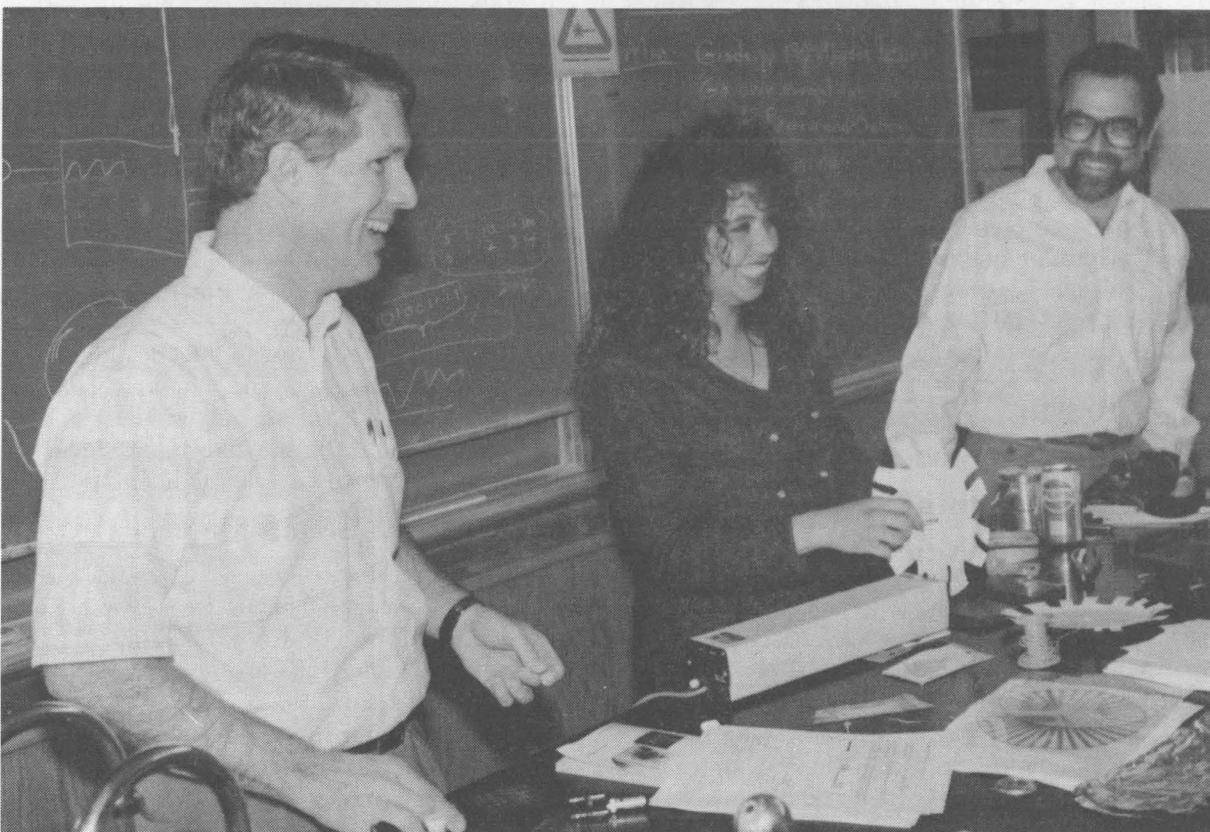
In addition to assessing compliance with all state, federal, and DOE regulations, the Tiger Teams looked at operations for conformance with "best" and "accepted" industrial practices to evaluate the adequacy of DOE and site contractor man-

agement programs. The Tiger Team visited Sandia, Livermore from April 30 to May 18, 1990, and a draft report of findings was provided to Sandia at the end of that visit. The team's final report was presented Nov. 5. DOE approved the Action Plan at the end of February.

Copies of the document may be seen at the Sandia, Livermore Reading Room near the Building 911 lobby, the technical library in Building 921, or obtained from ES&H Dept. 8540. •BLS



**SANDIA
LIVERMORE NEWS**



SCIENCE LESSON — Larry Rahn (left, 8354) and Dave Chandler (8353) demonstrate the everyday uses of lasers to a Global Science class at Livermore High School. The demonstration is part of a Sandia educational initiative to bring science resources into the classroom. The two Sandians are showing student Martha Carrillo how a notched paper plate creates a pattern of sound using a laser beam, an example of digital modulation somewhat similar to the method used to create compact discs. To generate sound, the laser is focused on a receiver; when the edge of the notched plate is twirled in front of it, interruptions in the beam create a rat-a-tat sound similar to that of a snare drum. The Sandians also demonstrated analog modulation, which is used in telephone transmissions.

Org. 7000 VP Retires After 39 Years**Intensity and Secrecy Marked
Bob Peurifoy's Early Days at the Labs**

When young engineering graduate Robert L. (Bob) Peurifoy Jr. arrived at Sandia in 1952, the Cold War was peaking, and Sandia was a fledgling, tightly focused laboratory with a crucial mission — quickly building a stockpile of nuclear weapons to defend against the urgent Soviet threat.

After 39 years of service, he retired from Sandia on March 15 (his 60th birthday), the Cold War apparently over, and with a long record of close involvement in — and his colleagues say major contributions to — diverse aspects of the nuclear deterrent that helped keep the world from global war.

Rising from technical staff member to Director of Weapon Development, before taking his current position as Vice President of Technical Support (7000), he has been in a unique position not only to shape the weapon program over nearly four decades, but to see Sandia grow, change, and evolve.

He has great pride in what has been accomplished at Sandia but is careful not to take personal credit for it: "I take a lot of satisfaction in the things Sandia has done, and it's nice to have been a part of it." He also acknowledges some concerns about the forces buffeting the labs in these troubled times of transition, and Sandia's responses to them.

He agreed to an interview upon his impending retirement only on the proviso that its focus be not primarily on him but upon Sandia itself, and the LAB NEWS agreed.

Phone Directory Was Classified

What was it like at Sandia when he arrived, June 9, 1952, fresh out of Texas A&M with a BS in electrical engineering?

"Intense," he says. "Secretive. A six-day work week was common.

"Many of the people here at that time had served in World War II. I had been a few years too young to enjoy that privilege, but it's clear that the war made quite an impression on those folks. They were dedicated to this business, and I guess some of it rubbed off on me.

"The atomic bomb was brand new and a certain mystique was associated with it. Sandia was smaller than today. It was highly focused. The goal was to quickly build an inventory [of nuclear

...the war [WW II] made quite an impression on those folks. They were dedicated to this business, and I guess some of it rubbed off on me."

weapons]. The phone book was classified. They still had guard towers at the main gates, high guard towers like the one outside Area II today. It's a relic of that period."

The Soviet threat was at times ominous. "There was an immediacy, an urgency, with regard to doing everything possible to be responsive to national policy in growth of the stockpile, variety of weapon types, and so on.

"Cost was of little consequence," Bob recalls. "During my early years at this laboratory, I was continually amazed that if you needed money, you got money. There were others with more experience than I, I'm sure, who were worrying about some of those details, but for the engineering staff there was no such thing as a budget. You



BOB PEURIFOY with models of arming, fuzing, and firing packages for the Poseidon C-3, Trident C-4, and Trident D-5 submarine weapon systems.

spent the money necessary to get the job done."

It was close to a crash program, and the mission was very serious.

"Keep in mind that there appeared to be a real possibility that we could go to war at any moment. I joined with a couple of friends, and we built bomb shelters at our homes. I don't mean just radiation protection, I mean blast shelters underground. In hindsight perhaps not a wise thing to do, but at the time it seemed they might be needed."

He was quickly thrown into a design organization working on the Mark V bomb. "That was the newest thing. It was an ugly old beast." They worked to make it better than its predecessor: reduced diameter, reduced weight.

Future Seemed Uncertain

Still, the future — even of Sandia and the other nuclear weapon laboratories — was not altogether certain. Bob finds it interesting, at a time when the national labs are now struggling to redefine their missions for the 1990s and beyond, to point out that even in the mid-1950s there was much soul-searching.

"Sandians were concerned that their mission was about over," he says. "We and Los Alamos seemed to have milked just about all the improvements that seemed useful out of the initial basic designs of the single-stage weapons. So in reflecting back, I believe there was just as much concern over the future of Sandia in the early 1950s as there is today. The national decision to pursue a thermonuclear weapon program did rejuvenate the laboratories.

"I had the good fortune to be associated with the beginning of the designs of the thermonuclear weapons, which was quite an exciting time for all concerned. That was a highly protected, compartmented program. Lots of excitement for a young engineer."

The challenges were numerous: how to package them for delivery, aircraft escape problems ("these were multimegaton weapons"), fuzing, readylife, storage.

Bob found his college background in electrical engineering served him well, but there had been no courses in "Bomb Building 101," as he puts it. "The basic grounding was fine; the details you picked up on the job."

The technologies involved were a far cry from what's available now. The transistor was still fairly new. "It was a noticeably different set of technologies we were using," he says. "Wet-cell batteries were the prime power sources, for example. I like to refer to that because the batteries we used were in no way comparable to the quality of an ordinary car battery of today."

This left considerable room for improvement, for creative challenges, and the use of young engineers' skill and imagination.

One of his early assignments was work on a maintenance-free nuclear weapon, the so-called "wooden bomb." For a highly complex electronic-chemical-mechanical mechanism, this is a rather astonishing achievement. (See "The Wooden Bomb.")

**Guarding Against
Accident and Malice**

Throughout his Sandia career, Bob was also involved in the development and implementation of the broad range of safety features that prohibit accidental detonation of nuclear weapons and safeguard against tampering and deliberate meddling.

This kind of work, by hundreds of Sandians, has contributed mightily to the safety, security, and reliability of the nuclear stockpile on which the country has depended for its nuclear deterrent. Bob has been involved with almost all aspects of this work, but he is quick to point out that it is Sandia that is responsible for these achievements. To whatever degree this readiness helped maintain global peace over the decades and contributed to the end of the Cold War, Sandians, he feels, can and should take pride.

"I have a tremendous sense of satisfaction in what Sandia has accomplished — but it is Sandia. It's not me, it's not any individual, it's not some small group of people, it's Sandia that made a superb contribution. We are among the few who have allowed this to happen. We've given the politicians time, and they seem to have done a rather good job in the last few years in finally defusing the big international situation.

"Now we're going to be tormented by small regional problems — such as the current one [the interview took place on the eve of the Allied ground war that liberated Kuwait from Iraqi occupation] — forever.

"Is the Cold War over — permanently? I would refuse to hazard a guess. It seems to me the opportunity exists, but I don't think it's guaranteed. There will be a need for nuclear weapons main-

(Continued on Next Page)

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tained by this country long after I'm dead."

Nevertheless, he agrees that the number and types of weapons should be debated, and says, "In the view of many people whom I respect, the present stockpile is larger than it needs to be."

The question arises, does the American public have a sense of what laboratories like Sandia have contributed to the national defense, through nuclear deterrence and other advanced military technologies?

No News Is Good News

"One of the best features of the program is that it's unnecessary to have it in the newspapers every day," he says, reflecting a view of many longtime Sandia weapon designers. "We are at our best when we don't make news. I want the public to feel confident that we are maintaining an appropriate deterrent and that its preferred state is one of readiness,

good reliability, and very high safety."

In his 39 years, Bob Peurifoy has seen Sandia go through many changes. "I think a lot of good things have happened, and I think there have been a few bad things. I wouldn't want to dwell overly long on the bad things, although they concern me. One good thing, for example, is the superb growth of the technical and administrative competence in the Laboratory — due in part, I think, to the urgings of several of the presidents who came from Bell Labs and to a recognition by the true Sandians of the need for and the value of extending and exploiting technology in the national defense. It's very pleasing to have been a part of this evolution.

"I have been involved in several studies or appraisals, and they remind me of the breadth and depth of the capability of the Laboratories — of the folks in the trenches who, for the most part, execute so well.

"You can call on a range of folks at Sandia to bring their skills and competencies and abilities to

bear on solving problems. It's very gratifying. We have a fine group of people here."

Keep Obligations in View

Nevertheless, he is concerned that we may lose sight of our basic sense of mission, of obligation involved in working at Sandia.

"This is a tax-supported laboratory. It doesn't exist for us to enjoy ourselves. We have obligations.

"Our prime obligation is to the nation's nuclear weapon program — in very broad form. The

"We must give the taxpayer the best run for his money by selective application of [Sandia] capabilities to other national problems."

technologies that we've assembled are in support of that obligation.

"Since it's all tax-supported, we must give the taxpayer the best run for his money by selective application of those capabilities to other national problems, but for the benefit of the country, not for our own enjoyment.

"If we're as good as I know we are, and if the nation has as many problems as I know we do, then we can afford, and should discipline ourselves, to be selective in our application of our skills to problems.

"Selective is the key word, in my view. I believe that if we're not of value to the country, we ought to go out of business. Our reason for existence is not just to exist. I can say that without much fear of its happening, because I do believe, without qualification, in the true capabilities of this laboratory as a whole."

Such capabilities have been demonstrated many times over, he says, and not just in the nuclear weapons program.

Good Works, Good Solutions

"I continue to be delighted by the responsiveness of Sandians when a real problem is identified to which we can apply our talents. There is a cohesiveness when that happens. There is a teaming, for the most part, and I think the result is good work, good solutions."

Pressed for examples of what he has in mind, he reels off a quick listing: "Safety, security, and control issues of all weapons. Brick Dumas's [9210] satellite [sensor] program. The support we gave to intrusion detection during the Vietnam War. Work under way in conventional munitions. The transportation and storage safeguards program and the propagation of those technologies into the military and other government agencies via the Forward Look studies headed by Andy Lieber [ret.]."

He thinks about it some more and continues:

"Look at the fine work that Dick Schwoebel [2500] and his team did with regard to the USS Iowa investigation — outstanding work.

"Our association with WIPP [Waste Isolation Pilot Plant, near Carlsbad, N.M.] is for me a big positive. It's a painful, frustrating, bitchy interface because of the complexity of the interactions. WIPP, or something like it, it seems to me, is essential. It's got to be done well, but it's got to be done. It's kind of a thankless job that must be done."

Bob Peurifoy has never sought the public spotlight. Indeed, he has consistently deflected it whenever it threatened to turn his way. Being told at the end of the interview that the talk didn't cover his specific accomplishments and contributions, he says, "Just the way I want it.

"If this has any value, it's to tell my friends at Sandia how much I respect them and acknowledge the good that they have done and are doing and that I hope they'll continue to do. That's what makes this a great place, in spite of some of my concerns. It's been a very rewarding career." ●KFrazier(3161)

The 'Wooden Bomb'

by Bob Peurifoy

(Editor's Note: The following article by Bob Peurifoy is reprinted from "Recollections for Tomorrow," Sandia's 40th-anniversary booklet, published for employees in late 1989.)

The "wooden bomb" concept is the notion that, regardless of the actual life span of a weapon, once it goes into the stockpile, it shouldn't have to be tested or serviced to be ready for employment. It can lie there inert like a log, year after year. It's essentially a completely assembled nuclear weapon in a high state of safe readiness.

Today, at Sandia, probably most people think of the wooden bomb as the norm. Presumably, weapons so critical to the country's deterrent ought to be ready. It wasn't always so. It took a lot of disciplined work by a lot of Sandians for a long time for weapons to get that way.

Like Erector Sets

When I started here in 1952, nuclear weapons were more like erector sets. The parts had to be tested and assembled. Batteries had to be charged. There were hours to days of preparation time. Weapons were not sealed when assembled. They contained chemically active materials and mechanical devices subject to corrosion. The power supplies, in my estimation, were markedly inferior to the ordinary Sears DieHard™ of today. They were real maintenance headaches.

Now, because of the wooden bomb, the service people who were burdened with testing, maintenance, and assembly are not needed. All the procurement of field testers — and there were hundreds of types — is gone, and the maintenance and calibration of those testers are gone. Also, by the very nature of the complex testing that was required to keep reliability up to DoD specs, we were damaging weapons during stockpile checks. That's been eliminated. All of this explains why, though I don't have figures to prove it, I believe that present stockpile maintenance is significantly less expensive than if we were doing today what we did in 1952.

It's impossible for me to pin down the genesis of the wooden-bomb concept at Sandia. I believe I started thinking about it in late '53 or early '54, but lots of people here were involved or became involved. The management group included, but surely wasn't limited to, Eaton Draper, Bob Henderson, Lee Hollingsworth, and Don Cotter.

Over the years, contributions from our materials scientists, chemists, metallur-

gists, and designers formed the foundation for what's been accomplished with the wooden bomb. By and large, these advances have resulted not from major, revolutionary developments, but from a variety of steady evolutionary developments that work together.

A good example of what's been done is the MC908 motor-driven chopper developed for the firing system of a number of our older weapons. Choppers switch DC voltage on and off — chop it — to make it look like AC, so a transformer will accept it. These miniature electromechanical devices went into stockpile in the early '60s — they were built in the tens of thousands — and they have essentially a zero failure rate.

To me, it's rather impressive that we traditionally have had the kinds of people — designers and others — who can design devices such as this very small, rugged, rotating mechanism with such attention to detail that they can live in the stockpile for more than 25 years and work when tested. [Through the years, 6,000 choppers have been tested. There have been no failures.]

No Gum-up with Chopper Lube

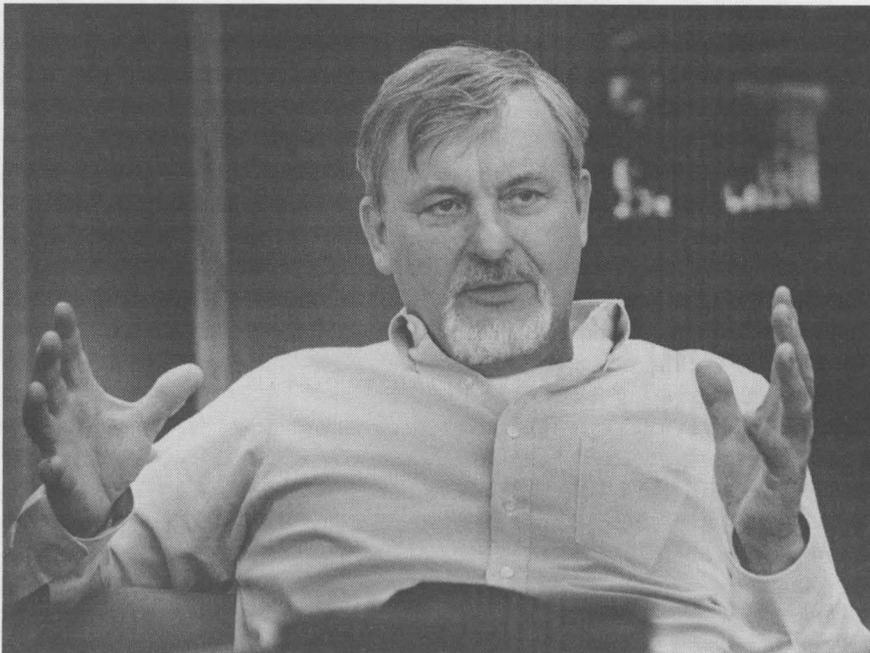
A lot of technologies went into that achievement. Think about lubrication. Over 25 years, most lubricants tend to gum up; you're asked to change the oil in your car every six months. Chopper lubricant is good for decades.

Another example: In the early '70s, the Labs materials experts and people in our process-development labs helped develop and produce long-life, high-efficiency RTGs [radioisotopic thermoelectric generators]. They developed a new silicon-germanium alloy for it, identified efficient ways to process the material, identified a way to bond wafers of the material, and came up with methods to make electrical connections between thermoelectric elements. To date, the service failure rate has been rewardingly low.

Another major advance has been thermal batteries. We used to make them out of 27 pieces; now it takes three. They contain no liquids and last for decades. They completely solved the maintenance problem associated with wet-cell batteries.

The first wooden bomb that went into the nation's stockpile was either the Mark 15 or Mark 28, depending on how rigorous a definition you use. That was in the mid- to late-'50s. Some models of the Mark 28 are still in the stockpile and are expected to remain there for several more years.

AL NARATH: "We should all do more independent thinking, get more involved, feel more responsible, and play a larger part in helping shape the future."



(Continued from Page One)

State of the Labs

sistent with our belief that there are opportunities that will help sustain the Laboratories in years to come. As I've said repeatedly, there's no lack of nationally important problems where the Labs can make important contributions. And as we continue making progress in our various initiatives, such as quality, as we improve our efficiency, as we work customer interfaces, I'm confident that we will have a telling impact for a long time to come.

Bray: Our operating budget for FY92 looks like it's going to be very nearly the same as this year's, and we hope to lose no more than inflation. That's the good news — that we don't see substantial deterioration in funding. But there are uncertainties, and we can't be complacent, because by the time we could see a real degradation in funding, it would be too late to respond effectively. There's no way to maintain our funding level except through superior performance.

Narath: There's some downside potential in this budget. First, the environmental cleanup and restoration programs in DOE continue to look very costly. It's not clear that the required funding is contained in the President's budget. There may yet be reprogramming within DOE, since the ES&H functions are receiving top priority. And of course Congress still has to do its work with the budget. That could lead to changes in our prognosis. So just because the President's budget appears to provide funding that we can live with, we better not relax. I agree with Lee — we're in an increasingly competitive environment. We just need to continue on the path that we're on and make certain we're superior performers.

LN: How about facilities construction?

Narath: The President's budget includes some construction line items we had planned, such as the robotics facility and CNSAC [Center for National Security and Arms Control]. Our facility plan appears to be generally on track. I admit to being disappointed that we didn't get support in the President's fiscal '92 budget proposal for completing the Phase 2 expansion of the Livermore Combustion Research Facility. But all indications are that DOE is supportive of the CRF expansion, and I'm optimistic that we will receive funding in the '93 budget.

LN: How about future years?

Bray: Probably our funding will be roughly the same, meaning we lose by inflation, and yet we've got more and more challenges in front of us. We really have to demonstrate that we can do more with less.

LN: How?

Bray: Every one of us has to look at the contribution we make. Maybe there are things we have done traditionally that we can either do differently or eliminate. We have to look for efficiencies. Our change management, empowerment, and quality

initiatives are all ways to say that we need the thoughts and commitment of every employee to maximize our productivity.

Jones: I agree. We need to be very careful how we spend the money we do have. For example, we're looking at possible consolidations of duplicate activities. In our strategic planning function phase 1A, we're reexamining our core competencies, determining which ones we truly will support and which areas we may have to let slide. So in addition to being efficient, I think we'll have to look very carefully at how we're allocating our money.

LN: With so much attention on the Middle East and the potential implications for oil supplies, are we going to see increased support for energy R&D?

Jones: The President's budget for our energy program is well below the '91 budget. In the past, Congress has often chosen to increase the President's budget substantially in energy. So we hope Congress will bring the energy program to the levels we've had in the past.

This year's budget aside, the Secretary of Energy's national strategic energy plan has been released and is being widely discussed. One thing it

"Where we have concentrated our efforts on working with industry, we've been very successful."

calls for is increased efficiency of domestic production. That's an area in which Sandia has led, through its oil-field recovery technology partnership, so we have good possibilities.

Changes in the Clean Air Act could also affect us. Legislation for the Los Angeles Basin calls for dramatic changes in the transportation sector — how we move people, how we move goods. So, though I would agree with Al that predicting is difficult, opportunities are going to be there, and we need to be sensitive to them. One of the great opportunities for our Livermore site, in fact, is to be particularly sensitive to what's happening in California. I think California will be the bellwether in air quality improvement.

Narath: Ultimately the solution to energy and many other problems rests with US industry. Energy R&D is only a small part of the solution to the energy supply problem. And, of course, oil prices are low again at the moment, so there's not a widespread feeling of urgency about energy.

Still, we can apply Sandia's technical skills if we can bridge to the private sector. Just having the government fund energy R&D, or environmental R&D, is not the answer. It's at best part of the solution, and it can help only if the results of R&D studies interact with the industrial sector. That interaction is the big challenge for the Laboratories.

LN: How are we doing in interactions with industry?

Narath: We have tremendous technical capa-

bilities, but we're still developing an understanding of industry needs and the marketplace. We have to match our capabilities to market needs. The way to do that is through stronger partnerships with industry. Where we have concentrated our efforts on working with industry, we've been very successful.

LN: For example?

Narath: I'm encouraged by early progress of the Specialty Metals Processing Consortium [SMPC]. Over the years I've also been very impressed by how Livermore has interacted with various companies in its combustion research program. Sandia has demonstrated that a government-funded laboratory can work with industry. We just need to do it on a larger scale in coming years.

Bray: Dan Arvizu [Technology Transfer and Industrial Relations Dept. 410] tells me we've submitted five CRADAs [cooperative research and development agreements] to DOE beyond the Specialty Metals Processing Consortium and that we have about 30 under discussion.

LN: A colloquium speaker here a few months ago said that the national labs have little understanding of industry and industry has little understanding of the national labs. Do you agree?

Narath: Well, I agree, but with reservations. We have evidence that we can work with industry. The key in every case is to establish strong person-to-person relationships. For example, people from member companies of SMPC have done research here, and some of our people have spent significant time working at company locations. In the course of such cooperative working relationships, you learn very quickly what the world is all about.

Rather than telling ourselves constantly how much we don't know, we ought to take pleasure in the rate at which we're acquiring the necessary understanding.

Jones: We need to be wary of statements suggesting that everything's homogeneous. We have people who are very experienced in working with industry. We have others who are much less experienced. We need to build on the base we do have. On the other side, some industries know how to work well with us. They can lead the way for others.

LN: We've talked about technology transfer for quite a few years. Is anything fundamentally new?

Bray: One major difference, it seems to me, is that in the old environment we were working principally with technology push — we created technology and we pushed it toward industry, if we saw sufficient incentive. In the new environment, it'll be more of a technology pull, with users identifying their needs, and us working cooperatively with them to help meet those needs — and I think with stronger incentives for both them and us.

Jones: I'm sure most Sandians know, but in case the word hasn't gotten around completely, technology transfer is a DOE mission. The Secretary of Energy confirmed that in one of his SENs [Secretary of Energy Notices] translating the law into his Department's operations. So this is not an add-on. It's not something you do when you can't think of anything else. This is part of our job.

LN: How can we measure our progress?

Jones: There are metrics we can monitor. One is cooperative funds for R&D coming in from industry. If they feel that the contributions we make are valuable enough, they will be willing to put in dollars of their own. Second will be royalty income. We've got seven licensing agreements out now. Given a few years, we hope we'll begin to see royalty income from those and others yet to come. Those are two metrics that come immediately to my mind.

LN: Are there any formal goals or targets?

Narath: We don't yet have the experience base to set targets for ourselves. But in a couple of years or so we'll probably be in a position to do so.

From a broader perspective, I'd like to get to the point where I can go to a corporation and ask whether its management feels that the government's investment in R&D done at Sandia in partnership with that company was, from a purely business point of view, justified. That is to say, whether the return was acceptable by industry standards. I can't imagine that in the long run we'll be able to justify multibillion-dollar investments in the national laboratories unless a real business case can be constructed.

Of course, this doesn't apply to the nuclear weapon program, because it has a different justification. In fact, it offers a double advantage to the nation, because nuclear weapon RD&T [research, development, and testing] investments first pay off in enhanced national military security. And at the same time, by establishing a strong technical base, we can leverage those investments to make additional contributions in our technology transfer efforts.

LN: On a more specific note, Sandia and AT&T are collaborating on an X-ray lithography project. Is there any special significance, given our relationship to AT&T?

Narath: We've actually had fewer such interactions with AT&T than with other companies. For this reason, I'm pleased that this opportunity presented itself. In terms of our interests and AT&T's interests, there happened to be a fit, and we're taking advantage of it.

Jones: It's coming along nicely. The possibilities are good for making this particular partnership with our sponsor valuable.

LN: Turning back to a more internal question, do we expect to downsize this year, and if so, can we do it strictly through attrition?

Narath: We'll do some shrinking this year, probably a few hundred positions, which we intend to manage through normal attrition.

LN: What does that imply for hiring?

Jones: Very limited hiring.

LN: What about positions we can't fill from within the Labs?

Jones: We certainly need new people in certain areas — more than a dozen ES&H professionals, for example. But in general, this is going to be a critical-technologies hiring year, not open recruiting.

Narath: Still, I hope there will never be a year when we don't hire outstanding special talents. One indicator of excellence in an organization is the number of outstanding people who leave because they're offered prestigious positions in other places, particularly universities. There'll always be that out-pull. We're having some of that, and those losses have to be offset by selected hiring.

Incidentally, I feel very good when I see former Sandians achieve success elsewhere. It speaks highly of the talent we have. We also have to be careful that we don't take the existence of this talent for granted. We need to continue building. But this year and perhaps next, our hiring

program will be very modest, according to our present projections.

Bray: We have to look carefully at what and where our losses are. If we lose critical capabilities, we have to replace them. On the other hand, to the degree that's not the problem, then we can look for selective additions in other areas.

Narath: Certainly we'll add ES&H professionals. We're currently not staffed at levels needed to achieve the level of ES&H performance that our customers expect and that we intend to reach.

Bray: I think our biggest problem in personnel planning is not in getting the numbers or quality we need — we can do that through judicious hiring — but deploying our people properly. The post-and-bid system can help, but it isn't the full answer. Changes in some organizations create new problems elsewhere when people move. We just don't have a good system to understand where best to deploy the talent that we have on roll. And

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ROGER THORP (143) and Melodie Owen (140) discuss Sandia's budget outlook for FY 1991 and 1992.

Tough Times Call for Extra Care in Spending

State of the Sandia Budget: FY91 and '92

This is one of the Labs' more uncertain budget years in recent times, and Sandians should do whatever they can to control costs.

That's the essence of what Melodie Owen, Manager of Budget Dept. 140, and Roger Thorp, Supervisor of Nonweapons Budget Div. 143, told the LAB NEWS recently about Sandia's fiscal status. Some specifics:

"One of our problems for FY91," says Melodie, "is that we received only 90 percent of our commitment authority from DOE at the beginning of the fiscal year. We expected DOE to release the remaining 10 percent in the final quarter. If not, we will have to reduce current-year costs or future-year commitments. With so many competing priorities for DOE funds, we don't know whether we'll get the entire 10 percent or something less."

Be Mindful

"With this unknown added to a generally tight budget," she continues, "we all need to be mindful about our spending. We have to ask ourselves whether each purchase is really necessary, or whether we really need to take that trip."

"The point of this attitude," adds Roger, "is that by being careful about purchases — which make up well over half our spending — we can minimize the impact on the 'people' part of our budget."

Sandia's weapon program funding has been fairly steady in dollars for the past few years, but the net effect is a loss equivalent to the inflation rate from year to year. Though that general pattern does not likely to improve, there are

some potential bright spots.

"There is projected growth in our direct-funded environmental restoration and waste management program," says Roger, "especially in the area of technology development, where Sandia can make significant contributions in such things as robotics, waste minimization, waste mitigation, and similar technologies. And we'll probably see some growth in our arms control activities as more treaties are put into place, as well as growth in our technology transfer initiatives."

Defense R&D Up

"The only category of the '92 Department of Defense budget request that's increasing is R&D," Roger continues, "and that's where most of our reimbursable funding comes from. However, we're conservatively projecting that our defense-related reimbursable work dollars will rise only by inflation."

"As we think ahead to FY92," says Melodie, "we can expect a loss equivalent to inflation in the weapons program. In addition, we must plan for costs to comply with requirements such as ES&H. Until the Tiger Team makes its report and we respond with an action plan, we can't be sure what the needs will be for 1992."

Melodie and Roger point out that the cost of ES&H activities, along with other initiatives that Sandia has undertaken as a response to a changing environment, has increased demands on Sandia's overhead budget.

"It's been a real challenge for the Administrative Management Committee to minimize increases in the overhead rate," says Melodie.

"Sandia will have to cut some services that are funded from overhead, but we're working with line organizations to minimize the adverse impact on the Labs while holding the line on cost."

Summing up Sandia's budget climate, Melodie says, "Times are tight, but there's no need to panic. Sandia's management is carefully working the budget situation so that we can keep a steady course for the future."

An estimate of Sandia's expenditures for the current fiscal year follows; amounts do not reflect any reduction in commitment authority.

Anticipated Sandia Expenditures, FY91 (\$ rounded to millions)

Defense Programs	\$632
New Production Reactors	3
Intelligence	2
Environmental Restoration/ Waste Management	59
Civilian Radioactive Waste Management	28
Conservation and Renewable Energy	37
Energy Research	26
Fossil Energy/ Strategic Petroleum Reserve	9
Nuclear Energy	9
Total — Department of Energy	805
Reimbursable	369
Total Operating	1,174
Capital Equipment	58
Major Construction	45
TOTAL	\$1,277

(Continued from Page Seven)

State of the Labs

we also don't quite know how to allocate hiring slots when we don't know where the losses will be. I'd like to see us work toward a solution to these problems.

Narath: I agree that we need to manage the internal movement of talent better. I think it's healthy for people to move around the company more than we've tended to do at Sandia. In a rapidly changing, very dynamic world, it's to our advantage to have people gain broader experience within the Laboratories.

Jones: We should think about a method we used in the mid '70s and early '80s, when we had very, very few geoscience professionals on the staff and needed more. We used the ones we had to train others, brought in outside lecturers as needed, and mobilized our INTEC [In-Hours Technical Education Courses] program. We probably need to repeat that.

It's at least partly under way now in ES&H. We need a number of new key ES&H professionals. But we also must educate others from among the people already on roll. This area is a national priority, and Sandia and Sandians can be leaders. We'll have to encourage movement within the Labs, to make it possible for people to get into these new areas of interest.

Narath: I support what Orval says, especially since trained people in this field will probably not be available in the numbers we will need over the next two to three years. We're not the only organization increasing staffing levels in ES&H. It's the same problem that faced us in the 1970s, in certain areas where we needed to grow faster than the outside supply permitted. So we leveraged the skills that we had by helping our in-house professionals train a new generation. Besides the geosciences, we've also done that in the Nuclear Regulatory Commission program, for which we trained our own staff in reactor safety technology.

LN: *As another form of internal adjustments and movements, many people have been thinking about the Albuquerque-Livermore relationship, especially consolidations. Any news?*

Jones: Last month, the Sandia Management Council appointed a Consolidation Advisory Group, consisting of directors and department managers and chaired by Paul Robinson [Director of Systems Analysis 9400]. We've asked them to review redundant activities that might be consolidated. That would help tie our locations together as two sites of one laboratory, rather than two separate organizations. They understand that we need to take advantage of capabilities at the two sites, and we've suggested that they look at the next consolidation moving westerly, if at all possible. Their recommendations should be out shortly.

This concept of consolidation extends beyond Sandia. Although there's no pressure to close any of the three labs [see "What Is the Future of the Nuclear Weapon Complex?"], there is definitely pressure from Washington to consolidate functions among the three weapon laboratories. People in Washington also see that our two Sandia locations have some similar functions, and that they sometimes view themselves as separate. We believe it's to the health of Sandia as a whole to pull ourselves together and integrate ourselves tightly in a way that requires us to depend more closely on each other.

Narath: I might add that Livermore recently completed a draft of a Strategic Plan for that location. That document strongly supports the notion of an integrated Sandia. It also recognizes the fact that the West Coast location affords Sandia a special set of opportunities, which we intend to capitalize on.

Bray: I think the way we're going about this question of consolidation reflects the new culture. We're trying to include input from as many of the

people involved as is reasonable, and to be sensitive to their needs. We're learning to work in a spirit of empowerment and participation. We had help from Dan Hartley [Vice President for Corporate Change Management 5] in understanding how to accomplish consolidation in a way that will be most acceptable to the staff.

LN: *Any idea how many people might wind up working directly on this question?*

Bray: The Consolidation Advisory Group consists of about a dozen, but it will expand so that maybe 40 or 50 people are involved.

Jones: This is really a learning process, at least for me, on how to work such a process in a less hierarchical manner.

Narath: It's better to involve a number of people up front, taking perhaps an extra month, than to spend months afterwards repairing bad feelings if the decision appears to be high-handed or poorly considered. When the study is completed, I expect the implementation to proceed smoothly and without difficulty.

Jones: Still, I don't want to minimize the pain and difficulty of consolidations. Some people may see reductions in things they have long been dedi-



ORVAL JONES: "For the good of the nation and our own good . . . we have to balance the welfare of our different organizations and staff. There needs to be a sense of win-win."

cated and committed to. But some degree of consolidation is essential for us.

For the good of the nation and our own good, I think that within Sandia, as well as among the three weapon labs, we have to balance the welfare and feeling of our different organizations and staff. There needs to be a sense of win-win among them — even as we consolidate certain functions or downsize others. If you like to think of musical chairs, when the music stops, nobody should be left standing up. We need to arrange for everybody to have at least part of a chair to sit down on.

LN: *So Sandia isn't competing with the other labs?*

Jones: We may be competing, in a sense, but it's not cutthroat competition. It must have an element of cooperation.

Narath: In the long run, what makes life exciting is to achieve progress. If we do duplicative work, it prevents us from investing dollars in things that will be more productive in the long run. It's not as if we're reducing the total effort. We simply want to invest our resources in ways that yield more to the taxpayer.

LN: *What can you say about Sandia's contribution to the Persian Gulf war?*

Narath: Possibly we'll say more later, but for now I don't think it would be appropriate to men-

tion any details. Naturally, as always in the past, we applied our talents to the best of our ability.

LN: *What about Sandia's role in advanced conventional munitions of the sort used there?*

Narath: I think that's too narrow a focus. What we really saw is that war has become highly technical. It's not just advanced conventional munitions. It's that every weapon system today has become extremely complex, and it demonstrates the importance of applying advancing technologies to weapon systems as rapidly as we can.

Jones: Let's remember how amazing the last 15 months have been. The Berlin Wall came down, and we went from a positive euphoria on one hand, people feeling like "We don't need weapons, no more war" — I'm exaggerating, but not too much — to being in a war.

So I would make three points. First, I think the Persian Gulf experience may cause a rethinking of the role of nuclear weapons, without the euphoria. As a nation, we will be able to think through the issues carefully and soberly. Second, I think there will be a renewed focus on smart weapons and their value. Third, I think there'll be renewed consideration for low-cost, readily testable weapons. So there'll be a continuing need for both high-tech and lower-tech weapons. Our work with the China Lake Naval Laboratory on the advanced-bomb family may be particularly important.

Narath: I would add a fourth observation. That's the importance of training and troop readiness. These weapons performed so well not just for technical reasons, but because of the extraordinary efforts the military services have made in training. I think the services, not just the technologists, deserve a lot of credit for the performance in the Persian Gulf. They showed a degree of professionalism that I find awesome. So technology, yes, but it goes beyond that — it involves the people.

LN: *Quality of people and their training is of course a broad national issue. Secretary Watkins emphasizes education as a DOE priority. Could we get an update on Sandia's educational activities?*

Bray: We now have about 1,100 Sandians involved in education outreach. That's one out of every eight Sandians. Many of them are volunteers, contributing their own time. A fair amount of time in addition is company-sponsored. We estimate that we're cooperating with more than 1,500 teachers. We think we're reaching about 80,000 students. So we have the reach and the impact we were hoping for.

LN: *Any responses?*

Bray: Bruce Twining [DOE Albuquerque Operations Manager] and Jim Culpeper [AL Deputy Manager] have said that they're getting very positive comments about our program. I continue to get that kind of reports from Mike Wartell [Education and New Initiatives Div. 35]. Other evidence of positive response is that we're getting additional DOE funding, and we may receive BIA [Bureau of Indian Affairs] funding to supplement our programs.

LN: *How much does the program cost?*

Bray: Currently, about \$5.5 million a year, of which about \$3.5 million is internally funded by Sandia. For the Science Advisor program, which is the one that has the largest impact, we're putting Sandians in 120 schools one day a week. That's nearly 25 FTEs [full-time equivalents]. That's the most cost-intensive program.

LN: *Are we sure it's worth the cost?*

Bray: I get nothing but extremely positive comments back from APS [Albuquerque Public Schools] and the individual schools where we have the Science Advisors. And our own people are commenting that it's going over extremely well. There's an evaluation phase, which will be done by the end of the school year. We expect to continue the program, but we'll see how the evaluation comes out.

LN: *What will the evaluation look at?*

Bray: As one example, we've surveyed students before and after programs to gauge their level of interest in science and mathematics. We've

learned that in the very early grades, kindergarten through third, they have a high interest in science and mathematics. By middle school, sixth grade or so, they no longer have that. We believe it's because they've been frightened by science. They've been made to think it's more difficult than it is, and that they can't be successful. We think we can turn that attitude around.

LN: *One criticism of science education is that it overemphasizes memorization.*

Bray: Yes, and the intent of our programs is to let the kids make discoveries themselves — let them feel and do and see. It's participative science.

Narath: There certainly has been a tendency — I've observed this firsthand — to concentrate excessively on the vocabulary of the subject, and to give the impression that a tremendous mass of material has to be memorized. It's easy to lose sight of the simple underlying concepts. Frequently we don't do well at showing how a small number of concepts can form the basis for explaining many things.

LN: *Are the teachers receptive to new approaches?*

Bray: We learned in one survey that only about 20 percent of primary and secondary school teachers feel well qualified to teach science — as opposed to about 75 or 80 percent who feel well qualified to teach English or reading. So obviously the teachers don't feel properly prepared. The primary aim of the Science Advisor program is to support the teachers. I think that we'll be able to help them develop better skills and knowledge, and they will in turn be more successful.

LN: *Does everyone agree that Sandia should be spending its money this way?*

Bray: I certainly haven't met many people who think it's inappropriate. Both the Congress and Secretary Watkins have left no doubt about DOE commitment to it and their intention for it to be a part of our mission. So I believe we're at a proper level and have a well-focused program.

Narath: Because of the capabilities DOE has in its laboratories, it can have a very large effect on kindergarten through 12th grade science and

math education with a very small incremental investment.

Jones: This is a strategic investment, one that will pay off after these students graduate from college.

Narath: Ultimately, US economic competitiveness depends on human resources and infrastructure. Of those two, I can't think of anything more important than improving our human resources. We have an opportunity — partly volunteer and partly funded — to have a significant impact.

Bray: We're ideally situated in Albuquerque. We're a large technical organization inside a moderate-size city, with one public school system to deal with. It's a great opportunity for partnering. We can also contribute to minority education, because of the large local Hispanic and Native American population.

LN: *Anything going on outside Albuquerque?*

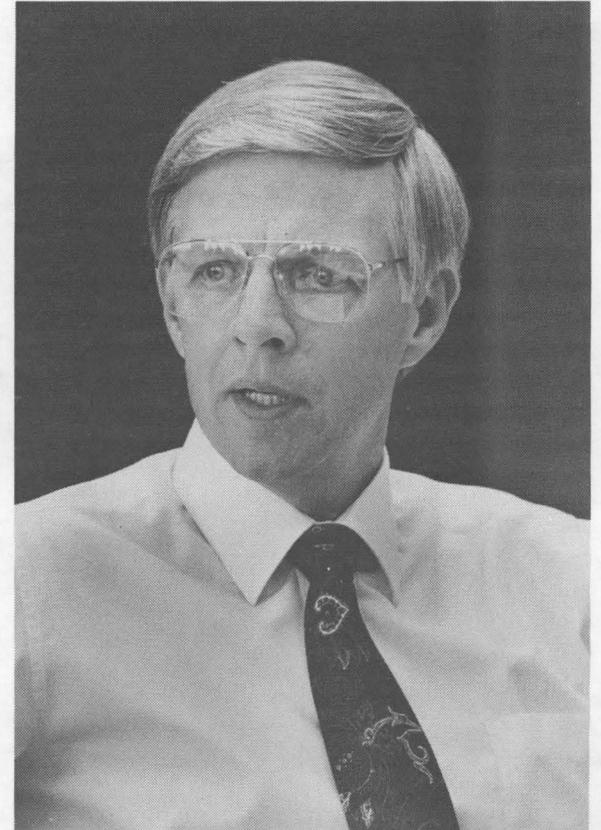
Bray: We're working with 20 BIA schools and 20 other outlying schools in communities such as Belen.

LN: *On a tangentially related subject — when we talk about core competencies, or Sandia's special capabilities, did I understand correctly that we are still defining what those should be, or do we have some kind of provisional list of what we should be really good at?*

Narath: It's not so much a question of "should," but what we *are* good at. National labs are very broad-based in their competencies. But we realize that no organization can be world-class at everything. We have to decide which competencies are crucial for mission success and, related to that, which we need to maintain at the cutting edge. That's a limited set, because resources are finite.

We have a provisional list. It includes such things as electronics, instrumentation, and half a dozen or so other areas. We're going to spend quite a bit of time this spring and into the summer studying that list, sharpening up our understanding to guide our future investment strategies.

Jones: We're calling it core competencies now, but a few years ago Tom Thomsen of our



LEE BRAY: "I get nothing but extremely positive comments back from APS [Albuquerque Public Schools] and the individual schools where we have the Science Advisors."

board expressed it as "differentiating strengths." That is, we have a special combination of strengths that sets us off from other organizations. We need to build on our fundamental strengths, and not lose sight of what they are.

Narath: The world is populated by many competent organizations. I'm not aware of any technical area in which we're uniquely capable. But in a number of areas, we do have differentiating strengths. To maintain our leading position, we have to focus our resources and attention on these areas. Where we can't afford to maintain leading-edge capabilities, we have to team with
(Continued on Page Ten)

Reconfiguration Study Is First Step Toward Answer

What Is the Future of the Nuclear Weapon Complex?

DOE last month released its Complex Reconfiguration Study, which has been described as a first step toward deciding the future configuration of the weapon complex. Specific decisions about the new configuration are expected in late 1993, after a period of public comment and further analysis.

A reference copy of the study can be consulted in the Tech Library (Room 100). The Library has ordered a second copy for check-out.

President Al Narath says that the content of the study is essentially what most knowledgeable observers expected: "Nothing in it came as a surprise to anybody who's been involved in the weapon program. The study did not address in any detail the future of the three weapon labs [Sandia, Los Alamos, and Lawrence Livermore], other than to point out that there are no plans to push any one of the labs out of the weapon program."

Still, he continues, changes must come: "The study focused on something that all of us have known for a long time — the nuclear weapon production complex, in its present configuration, will not serve the needs of the nation in the next century. It's too large, it's too old, and it needs a lot of streamlining."

Some Production in Private Sector

These changes will inevitably affect Sandia, says Al. "As far as Sandia is concerned, the most important element is the proposal that a significant fraction of our designs be produced in the

private sector. It's called privatization of production. That will force us to transition some of our designs not into a captive production complex, but private industry."

Interactions with Industry

Al welcomes privatization: "The change will play well with our interest in technology transfer and stronger interactions with American industry."

Executive VP Orval Jones says, "The good news certainly is the commitment in DOE headquarters to preserve the three laboratories. But the nature of our nuclear weapon work and our relationship with the manufacturing complex is going to change substantially as the production complex changes.

"To help Sandia look forward to how we might operate in this world of privatization," Orval continues, "Harry Saxton [Director of Semiconductor Components 2100] has been exploring with Allied Signal — Kansas City and with Steve Guidice [Assistant Manager for Operations and Weapons] at Albuquerque Operations a couple of concepts. One is that of a manufacturing development center [MDC], which is not too different for us from our present approach. The other is manufacturing development engineering [MDE], in which Sandia in effect would design, develop, and procure certain parts directly from outside vendors. The parts would then go to the assembly plant for incorporation in a weapon."

Orval doesn't expect complete privatization, however: "It's not realistic to try to procure everything from private industry. There must continue to be elements of the production complex. How all that's going to come together remains to be seen."

Asked whether Sandia might find it uncomfortable to shift to a new way of interacting with the production complex, Orval says, "MDC could actually take us back to a mode we used in the '50s and '60s. It does place an emphasis on manufacturing engineering, in which we may not be as strongly staffed as we desire. But we have the engineering talent to develop that skill."

Far-Reaching Changes

Orval, like Al, foresees effects beyond the direct changes in the nuclear weapon program: "Manufacturing engineering has broad implications. We're exploring some of those now. For example, Joan Woodard [Director of Environmental and Manufacturing R&D Programs 6600], Jim Baremore [Manufacturing Programs Dept. 6610], Joe Polito, and Sam Varnado [both Programs Development Dept. 430] are promoting environmentally conscious manufacturing.

"Also," he continues, "the ability of the US to be a competitive world manufacturer has to be part of the American future. Changes in the weapon program can help Sandia develop skills and techniques to help the nation move smoothly along that path."

(Continued from Page Nine)

State of the Labs

other organizations if those skills are needed to satisfy our customers.

LN: *As one example of an area that we would like to see Sandia do more in, we hear health technology mentioned from time to time. Do we have the necessary "differentiating strengths"?*

Narath: Differentiating strengths are not necessarily application-specific. We don't have traditional strengths in health care, but we do have strong capabilities in electronics, diagnostic instrumentation, systems engineering — so there are core technical capabilities which, we think, can be applied advantageously and competitively to certain aspects of health care, such as non-invasive monitoring of glucose. A number of exploratory efforts are under way. For some years we've had a relationship with the UNM Medical School in drug delivery systems, particularly insulin. We're looking for other opportunities. But we're in the early stages of assessing our future role.

Bray: In the past we had technology, but little knowledge of where that technology could be applied outside the laboratory. CRADAs give us opportunities to team with companies that have applications but don't have the technology they need.

Narath: It's critically important to understand where contributions can really make a difference. For example, in health care, it's important to apply technology in ways that reduce cost, not just add another piece of instrumentation that further drives up costs. The market pull today in health care is to deliver it at lower cost.

LN: *Surely we have to maintain the core competencies that support the weapon program. But I get the impression of level or perhaps shrinking funds for weapons. Is that what we're seeing?*

Jones: We seem to be getting relatively level dollars each year, but level dollars don't make up for inflation. So we've been losing four or five percent per year in that regard. But at the same time, as was mentioned earlier, there are activities that have been inserted that also have to be serviced, such as the ES&H initiative, and so on.

Narath: It's still a very large program, of course. And beyond that, there's no one-to-one correspondence between the importance of our weapon program contributions and the magnitude of the budget. The country has many problems facing it, and it's having to allocate available resources accordingly.

LN: *Presumably we're not looking toward the extinction of weapon work at the Labs.*

Narath: I've said very often that I can't imagine nuclear weapons disappearing from the face of the earth during my lifetime. For a very long time, our national security will require a credible nuclear deterrent. Maintenance of the nuclear deterrent will require a capable RD&T resource. Now, the number of Phase 3's [Development Engineering, following Phase 2 Feasibility Study] may change in time, but the program will continue to be vital.

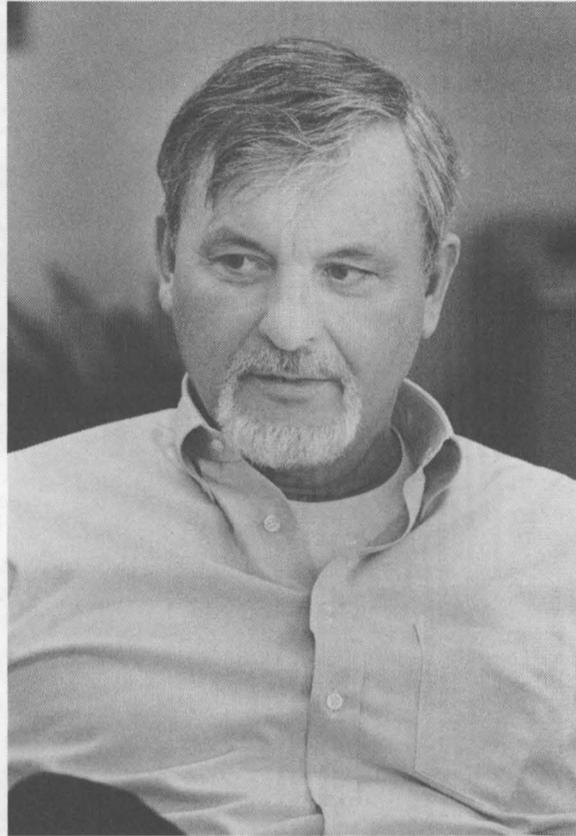
Jones: Its character may change — in fact, has been changing — from making aggressive weapons to weapons aimed at preserving the peace or deterring war, as Al says. That generates an even stronger emphasis on safety, security, control, reliability, and survivability. There'll be a search for new and more creative ideas about how to build safety into weapons.

The recent Drell panel, which was commissioned by Congress to study nuclear weapon safety, has completed its recommendations. DOE and DoD are in the process of deciding how to respond. But the overall call is for heightened sensitivity to safety. Sandia has always been in the vanguard of safety. It's not to say we can't do more, but I think our contributions in that area have been recognized. Even before this report, we had decided to upgrade our formality of opera-

tions in weapon safety assurance, and developed a weapon nuclear safety assurance plan that Al signed off toward the end of last year. Lee and I went to Livermore to review the W89 as part of the executive management oversight of the safety that we have designed into weapons.

LN: *What about arms control? How may that affect Sandia?*

Narath: Our administration has committed itself to supporting sensible arms reduction agreements. We can therefore expect some reduction in the number of weapons in the stockpile. But that really has no bearing on the issue at hand, because we are an RD&T organization. Our responsibility is to continue to maintain — and upgrade where



AL NARATH: "In spite of all these new pressures on everyone at Sandia, there really is an impressive continuing stream of technical and other accomplishments."

necessary — the stockpile, irrespective of the numbers of weapons that the stockpile might contain. For instance, delivery systems will surely change in the future. That alone will drive the need to either modify or build new nuclear weapons. Furthermore, no nuclear weapon will last forever. They do need to be replaced from time to time. I understand the political pressures, but I see those operating primarily on numbers of weapons, not types of weapons.

Jones: Another viewpoint is that if you're going to downsize the stockpile and have substantially fewer weapons, then your insurance policy would be to maintain a strong RD&T activity. I think that's what we'll be seeing.

LN: *But, as you said, there will be real cost constraints.*

Narath: We must find ways of designing weapons that cost less to design and then less to produce — and are also environmentally more acceptable in production. At the same time, our customers require even greater reliability than in the past, because the military services are under pressure to reduce their costs as well. Every time there's a problem in the stockpile requiring some retrofit action, it causes financial problems for the customer. One of the consequences will clearly be a move toward greater standardization in weapon design. At first glance, you might think this will limit opportunities for our engineers' inventiveness, but I don't see it that way at all. If anything, it increases the challenge, because the cost constraints, along with the demands for increase in safety, control, and reliability, will surely provide challenging opportunities for creativity in weapon design.

LN: *Are you saying there are actually more opportunities today than in the past?*

Narath: I don't know about more, but program demands are constantly changing. We're not pursuing a going-out-of-business course. One of the challenges clearly is to make every design provide maximum flexibility in terms of operational capability. A given warhead might have to serve multiple applications. That in itself, by expanding the operational envelope, poses some significant design challenges.

Jones: I think the B61, which has now turned into the W61 penetrator weapon, is an example of the flexibility and adaptation challenge that'll face us. The W61 has been a real success story over the last couple of years.

LN: *Any opportunities outside our traditional weapon development activities?*

Narath: Over the years our responsibilities in the nuclear weapon program have broadened tremendously. For example, take Sandia's efforts in treaty verification technology. We have by far the largest program anywhere, and it serves a very important function. If we're going to have arms control treaties, there have to be ways to verify compliance.

Jones: I think Sandia will play a more important role in the production-related areas. Part of making weapons less expensive is to be more thoughtful about how they'll be manufactured. That's interesting in its own right, and it bears on the future economic competitiveness of the US in manufacturing. It may not have a high-science allure, but in the strategic sense of where the US has to go, it's right on the money. So I think we're going to see shifting emphases. The mix of problems is changing. And our staff, our management, we're all going to have to flow with that and apply our talents as they are needed. I think there is significant opportunity for us to take a stronger role in supporting Albuquerque Operations in its production responsibilities.

LN: *Any particulars you'd like to mention?*

Jones: We're involved in one right now that's important to both us and DOE — the AL-SX shipping container, which is for moving tritium. It's almost a prototypical example of Sandia demonstrating that we can design something on time and within budget, go to industry, and get it manufactured and delivered to the Services.

LN: *What about weapon security?*

Jones: As you may recall, Sandia's work in security, safeguards, and physical protection grew in the mid '70s as a response to world concern about the Munich Games terrorist incidents, nuclear proliferation, loss of special nuclear materials, and so forth. We are still the lead laboratory in the country for that, and I see a resurgence of interest.

LN: *What about nuclear energy, waste disposal, and the technologies in that area?*

Narath: The acceptance of nuclear power hinges on safety and environmental issues. The big issue is disposing of nuclear wastes. Until acceptable solutions are found — not just technically, but politically acceptable — I don't see much opportunity for growth. We play an important technical role in the Waste Isolation Pilot Plant project at Carlsbad. We have a similar role in the Yucca Mountain high-level commercial waste repository program. We've also been involved in shipping-cask technology.

Jones: Something like 20 percent of the nation's electrical energy comes from nuclear plants. Maintaining the life of those plants is an issue that Sandia has been addressing. Our most immediate contributions to nuclear power as an energy source for the US may be in that area. I don't see any ground swell developing for building more nuclear plants.

LN: *What are we doing for the extension of plant lifetime?*

Jones: Most of the difficulties tend to be equipment outside the reactor — valves, piping, controls, and so on. Mostly we've tried to develop a strategy toward improved system reliability. Bill Snyder [ret.] began this initiative, and that's the

area we've been pursuing.

LN: *Any other nuclear-related work?*

Jones: Several programs for nuclear propulsion and space electrical power hold promise. Some relationships with NASA here seem to be evolving for us.

In the longer run, the issue of burning more fossil fuels raises the question of increasing average worldwide temperatures. You might think that would suggest a comeback of nuclear power, but not necessarily. The renewable energy sources, solar and so on, are also touted at this point.

LN: *Combustion research has been one of our strengths — is it still healthy?*

Jones: The interest of auto companies and the combustion and heating industry seems as high as ever. Cooperative staff from many companies are working in the CRF. And we continue to have strong operations funding in this area from DOE.

Narath: We tend to get preoccupied these days with the challenge of change. We worry about increasing competition among the labs. We worry about our ES&H performance.

It might appear to an outsider that we're just barely hanging on. But in spite of all these new pressures on everyone at Sandia, there really is an impressive continuing stream of technical and other accomplishments. There just doesn't seem to be a slowdown. I see it in the combustion program, in high-temperature superconductors — the superconducting flux-flow transistor — in massively parallel computing, to list just three instances.

In regard to the parallel-computing activity, what is remarkable is that with modest, though strategically placed, investments over the past several years, we have established an enviable track record, as measured, for example, by the number of awards and other forms of recognition. We're working hard to gain DOE support for an

"I see an increasing harmony in what may seem disjointed activities."

expanded facility. We're planning to link the Albuquerque central computing facilities with Livermore, where we dedicated the Center for Computational Engineering last year. So we'll have hardware and software development in Albuquerque, and engineering applications and interfacing with industry at Livermore. At the same time, we'll gain firsthand experience in high-speed networking between two locations.

I think there have been very remarkable achievements in our compound semiconductor work. I'm also very pleased by the contributions Sandia has made in the silicon integrated circuit area, particularly in regard to the work we've done for SEMATECH. There's a very long list of accomplishments, only some of which we had space to feature in the last LAB NEWS Labs Accomplishments [Feb. 8].

LN: *What's our role with SEMATECH?*

Narath: We're working with some of the fabrication-equipment manufacturers in increasing the reliability of their equipment, or at least helping them understand what the principal factors in reliability are. We've also made contributions in the human interface area.

We recently had a visit from Bill Spencer, an ex-Sandian who's now CEO of SEMATECH [LAB NEWS, Feb. 22]. He has a vision of SEMATECH in the next few years putting into place an integrated-circuit fabrication process which is world-class — next-generation, ahead of anything that now exists anywhere in the world, and based on US equipment. That will involve tremendous advances in processing — greater automation, perhaps processing that doesn't require a large clean-room facility. I see some significant opportunities for Sandia to assist SEMATECH in that.

Jones: Remember that SEMATECH involves a lot of companies. To the extent that we please that customer, we're also communicating to a

much broader group of companies about what we can be and can do.

LN: *Are we perhaps trying to do too many different things at once?*

Narath: I see an increasing harmony in what may seem disjointed activities at Sandia — weapons on one hand, and competitiveness issues on the other. They're really all coming together. First of all, industrial interfaces are becoming as important in the weapon program as they are in our other activities. I think the work we're doing for SEMATECH demonstrates that we can work that interface very effectively.

But beyond that, I see a growing need to emphasize what has been termed dual-use technologies, making greater use of commercial

"The course we have set for the Laboratories is long and challenging, but Sandians, as always, are rising to the challenge."

technologies in defense programs. At the same time, government R&D investments can — because of this dual-use nature — support both defense and commercial needs. We have opportunities in our R&D to support the needs of the weapon program; at the same time, those same technologies are going to find use in the commercial sector. So it's all coming together. You can put it all under the heading of national competitiveness, if you want to.

LN: *Of course, for the very near future we do have a sort of preoccupation. How do you view the upcoming Tiger Team visit to Albuquerque?*

Narath: Remember that the Tiger Team visit represents just a milestone. It's not the end of the program. It's a midterm examination, if you will. I expect recognition that we've made tremendous progress, and I also expect the visit to point out that we have a long way to go. But let's remember that the ultimate objective is to achieve ES&H excellence. That's going to take several years.

So my expectation is that the Tiger Team will tell us we're on track. But that will depend on the Tiger Team being convinced that we're all together on achieving that objective. It's very important that everyone understand what our goals in ES&H are, and understand in sufficient detail the steps that we're pursuing to get us there.

Bray: During brownbagging sessions ["Brownbagging with Brass"], I always ask whether the people there have any doubt why we're undertaking this ES&H effort. Earlier, comments invariably came back saying that they didn't see the need, that we were already in good shape. But recently, I've heard that response much less frequently. I say, "Why do you think we're doing it?" and they say, "Because we need a safe and healthy place to work, and we're not sure we've done as well in the past as we might have." I think nearly everybody is convinced at this point.

Narath: For a while, there was a general feeling that we're doing all this because DOE is re-

quiring it. But we began to see many opportunities for making Sandia a safer place and one that is more sensitive to public concern about the environment. In my discussions with many people, I have observed a strong and growing commitment to doing the right thing. The objectives and goals of the program are being accepted widely as inherently worthwhile, not just demands Washington has placed on us.

Jones: We need commitment, understanding, and support from all our employees. The Tiger Team will be large enough and will be here long enough to talk to every Sandian, if the Tigers choose to. They're going to get a broad sample of how Sandians feel and act. We're going to have to have every employee's dedicated, persevering support.

Narath: It's an opportunity to demonstrate empowerment. Rather than the traditional "I haven't been told yet what to do," the response should be, "I may not know it all yet, but in the meantime, here are the things that I personally feel responsible for."

LN: *Are you apprehensive about the visit?*

Narath: I don't have any significant concern over the outcome. In my walking around, and some recent audits that have been done, my conclusion is that the message has been received, and the commitment is there. I appreciate the way Sandians everywhere have responded.

LN: *What about after the Tiger Team?*

Jones: ES&H is a preventive activity, not a fix-it. We have to move to a new plane of continuing awareness and sensitivity.

Bray: That's an excellent point, because the natural tendency would be later to turn to some other challenge and let this one slip. We're going to have to keep management attention focused on maintaining ES&H excellence.

Narath: What I find particularly encouraging, as I walk around the Labs, is that people are thinking, much more deeply than ever before, about what the hazards are in their workplaces. Though not all the risks are yet quantifiable, the awareness level is much greater.

LN: *How do you think Sandians are responding to the stress of the various pressures at the Labs?*

Narath: Sandians are teaming together and putting in long hours to try to keep up with the pressures we are facing now. Many employees are working seven days a week and have been for many months. I know the course we have set for the Laboratories is long and challenging, but Sandians, as always, are rising to the challenge. Working together, we are making good progress.

LN: *As a final question — If you could communicate just one thing to every Sandia employee, what would it be?*

Jones: Their sense of leadership, empowerment, and quality is the bedrock for the future.

Bray: I would add just one idea to what Orval said — internal teamwork to help us get there.

Narath: We've had a wonderful past, and the future is in everyone's hands. It's ours to build. Aim high! ●CS

feed back

Q: *Why can't job listings published in the Weekly Bulletin describe jobs in terms of the customers you will serve and the suppliers that will serve you? This labeling is encouraged in the Quality Seminars and would help job applicants understand all the expectations of a job listing.*

A: Job announcements in the *Weekly Bulletin* alert potential bidders to job openings and briefly define the job and its requirements. Bidders are then able to evaluate their interest in the position and their qualifications for performing the job. The posting is not intended to be an in-depth description. Also, to keep the *Weekly Bulletin* from

becoming excessively long, job postings are limited to 30 lines.

Discussing job requirements in greater detail is one of the reasons for the interview. The supervisor should then describe the requirements in detail and can also discuss the customers and suppliers involved. It is important to recognize that a listing of customers and suppliers would likely be misleading, since future assignments and projects of the job may involve a completely different set of customers and suppliers. The general job announcement tends to be more accurate over time.

Marv Torneby (3530)

TIGER TALK — Dave Spence (center), leader of the ES&H Tiger Team that begins its Sandia, Albuquerque visit on April 15, discusses logistics with Glen Cheney (left), VP of ES&H Improvement and Compliance Program Management, and Al Chernoff, Director of DOE's Kirtland Area Office. The Tiger Team is expected to be at Sandia for six weeks.



(Continued from Page One)

Tiger Team Visit

with Rod Geer and Will Keener of Community Relations Div. 3163.

Highlights of that discussion:

Q: Why were you chosen to be the Tiger Team leader for Sandia, Albuquerque?

A: I don't believe there was any specific reason. I participated in a Tiger Team training course for senior DOE executives last year. We were told then to expect to be a leader or deputy leader at some point in the future.

Q: Athletic teams usually go into a match with a game plan. What is your game plan for Sandia, Albuquerque?

A: The sub-team leaders and I will formulate a site-specific assessment plan. We'll try to rank-order the ES&H significance of your activ-

"What's the requirement? Do you have a procedure? Are you following the procedure?"

ities and site, and concentrate on them. We know that we can't look at all 800 or so separate physical facilities.

We'll develop that plan, in part, by looking at past appraisals. The Pre-Tiger Team Self Assessment Report [PTTSA Report], past technical safety assessments, other compliance assessments, and audits will be grist for that mill.

Q: How important is the PTTSA report to your work?

A: It's very important. It gives a picture of management's perception of the Labs' problems. With it, we'll be able to compare directly what areas they think need improvement with areas that we believe need to be addressed. If we have widely differing views, then we have a real problem.

Q: Is being a Tiger Team member a physically hard job?

A: It's a very intense mental job. In order to be effective, our team members have to be thinking at a high intensity all of the time. Also, we'll be away from home and family for four, five, six weeks. But, I think the value to be accrued by the department [DOE] and Sandia makes it worthwhile.

Q: We've heard that the workday for the Tiger Team is 7 a.m. to 8 p.m., seven days a week. Is that really true?

A: That would not be an exaggeration of my work day. I would like to think that we won't have to work on Sundays, but once the schedule is in place it will define how we spend our time. I would like to think that most of that weekend work will belong to the Tiger Team. That assumes, however, that we can meet our weekday appointment schedules.

Q: Do you see any of the three sub-teams — environmental, safety and health, management — as more important than the other two?

A: Perhaps the most important is the management team. And if that's true, it's because this team will try to put into perspective the findings of the other two, plus its own.

Q: Do employees need to be concerned that they may be interviewed by a member of your team?

A: They should not. They should communicate freely and openly. This is not a shoot-the-messenger activity. I believe that if we find problems at the worker level, it won't be because that individual doesn't want to do a good job. It will be because that person doesn't understand the requirement and doesn't have the right kind of training or leadership.

Q: What do Tigers look for in an employee during interviews?

A: They will determine whether employees know ES&H requirements for their activities. The Tiger will ask whether employees have procedures that spell out how they are to meet requirements. And do the employees, in fact, have physical evidence documenting that they are following procedures? Those are the three basic elements: What's the requirement? Do you have a procedure? Are you following the procedure?

Q: Do Tigers just like to sit back and watch processes?

A: You have to observe some activities to get a feel for whether procedures are being followed. As an example — long before there were DOE ES&H Tiger Teams — I would go into a facility to look at a welding activity. I'd see if the worker had a procedure and whether the worker was qualified to perform that procedure. Then I'd observe the process to see if the worker was following the procedure.

Q: What can we do to facilitate the Tiger Team process? Employee? First-line supervision? Upper management?

A: Each level has to be open and honest. Describe your activity or your job. There will be differences for the different employee classifications, however. We're looking to supervision and management for leadership in ES&H areas. We'll look more for compliance of procedures at the individual worker level.

Q: Has a Tiger Team come to the Strategic Petroleum Reserve? Or is one coming?

A: We had a technical safety appraisal before the ES&H Tiger Teams became active. I'm told that a Tiger Team will come to the SPR in FY92. So, one of the things that this experience will allow me to do is to go back and look, in retrospect, at the way we do business in ES&H areas and prepare for our assessment.

•RGeer(3163)

About 60 to 70 'Tigers' Expected At Sandia

This is the seventh in a series of "helpful hint" columns as we strive to improve our ES&H performance and to prepare for the visit of the DOE Tiger Team beginning April 15.

TIGER TEAM TIPS



What's a Tiger Team? Typically, the team is organized with an overall leader and three sub-team leaders.

Sandia is expecting about 60 to 70 working "Tigers" plus assistants and support staff. Dave Spence is team leader for the Sandia appraisal.

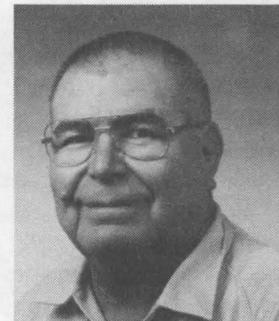
Jane Monhart, acting manager of DOE's Brookhaven Area Office, will lead the management sub-team. This is often the smallest group, and about a dozen members are expected to participate at Sandia. They often come the first week, then leave and return midway through the assessment, because their work depends on findings from the other teams.

Donna Bergman of DOE's Office of Environmental Audits will be on her sixth Tiger Team when she arrives at Sandia to become environmental sub-team leader. This team will probably have about 25 Tigers.

Steve Singal and Myrna Steele, both of DOE's Office of Safety Appraisals, will head up the Safety and Health sub-team. Singal will be sub-team leader and Steele associate leader. The safety and health team is always the largest and may have more than 30 Tigers.

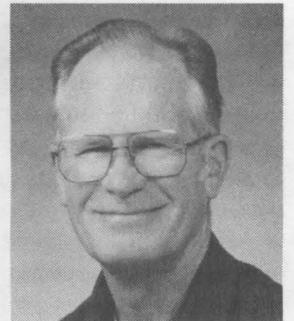
Tigers usually start early and stay late, often working seven days a week. Daily debriefings, attended by a few Sandians, follow a day of interviews and reporting work and usually begin about 4:30 p.m. They can last until 6:30 or 7 p.m. because the day's activities are reviewed in detail. •

Recent Retirees



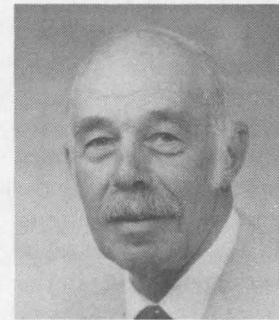
John Anaya
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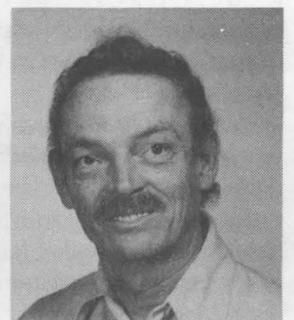
Alton Meador
7525

36



Bob Sonnenberg
7210

33



Jim Pennington
3153

35



Edward Lane
7411

34



Robert White
7232

25

Welcome

Albuquerque — Andrew Aragon (3435), Joseph Campbell (3435), David Garcia (3435), Donnie Greene (3435), Michael Luna (3435), Benjamin Madrid (3435), Steven Moodie (3435), Matthew Torres (3435); Other New Mexico — Daniel Barela (3435), Timothy Carr (3435), Tranquilino Gutierrez (3435), Vincent Lucero (3435).

Supervisory Appointments

ARTHUR SHARPE to Supervisor of Saturn Operations Div. 9342.

Art joined Sandia's Track and Cables Division in 1964 as an electrical technician for the sled track and variable-angle rocket launcher. In 1966, he transferred to the Data Acquisition and Instrumentation Division, where he did circuit design and magnetic flier plate facility design and construction. He joined the Pulsed Power Research Division in 1972, handling design and construction assignments for the Proto I, Radlac I, and MABE accelerators and design responsibilities in the early phase of the Hermes III project.



ART SHARPE

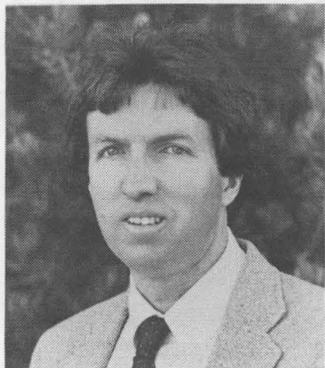
Art transferred to the Simulation Applications Division in 1986 as functional representative for assembly and test of the Saturn accelerator project. In 1987, he was appointed Supervisor of the Saturn Operations Section.

He attended Ithaca College where he was a math major. He has an AS in electrical technology from State University of New York. He has taught pulsed power technology in Sandia's Out-of-Hours program for seven years.

Art enjoys golf, bowling, church choir, and teaching Sunday school. He and his wife Jeanne have three grown children and live in Bosque Farms. His daughter, Dawn Smith, works in Div. 2541.

LARRY WALKER to Manager of Sensor Systems Dept. 9230.

Larry joined Sandia's Satellite Sensors Division in 1977, where he designed and tested electro-optic satellite payloads. He also served as project leader for several of these programs. He was promoted to supervisor of that division in 1983, and served as project manager for a number of DOE/DoD satellite payloads. During the summer of 1989, Larry was appointed to represent DOE as the scientific advisor to the US delegation negotiating the Strategic Arms Reduction Treaty in Geneva, Switzerland.



LARRY WALKER

He has a BS and an MS in electrical engineering, both from Oklahoma State University.

Larry enjoys jogging, skiing, fly-fishing, softball, and reading. He and his wife Mary (1556) have two children and live in the NE Heights.

SANDRA BARNES to Supervisor of Continuing Technical Education and Training Div. 3522.

Sandra joined Sandia in 1969 as a secretary in the Aerothermodynamics Projects Department. In 1974, she transferred to the Semiconductor Devices Department. She was promoted to MLS in 1974 and joined the Personnel Operations and Services Division, where she managed the Secretarial Work/Training Program. She joined



SANDRA BARNES

Education and Training Division I in 1976 and managed the Secretarial and Clerical Work/Training programs. In 1979, Sandra transferred to Education and Training Division II, where she was an education and training consultant and program coordinator for INTEC.

She became an Administrative Assistant in the Components Directorate in 1984. From 1987 to 1988, Sandra was a nuclear weapons media specialist in the Weapon Procedures and Logistic Support Division. She was the Org. 2000 personnel representative from 1988 until her promotion.

Sandra has a BS in education from UNM and has done graduate work in public administration there. She's a member of the National Society for Performance and Instruction.

She enjoys playing bridge, skiing, golfing, and collecting art. She and her husband Ed Graham (3600) live in the NE Heights.

WILLIAM PATTERSON to Supervisor of B61-6,7,8/W61 Div. 5111.

Bill joined Sandia in 1958 as a member of the Manufacturing Development Component Division, where he was responsible for manufacturing development of the MC865 firing set. From 1960 to 1964, he was a mechanical design engineer in the Aerodynamic Model Design Division. He served in the Rocket Systems Division from



BILL PATTERSON

1964 to 1965, where he was project engineer for the Readiness Program. He transferred to the Terradynamics Division in 1965, working on low-velocity impact, high-velocity impact, and hard-rock penetration studies.

From 1976 to 1978, he was terradynamics consultant to the Pershing II Earth Penetrator Weapon (EPW) program. He was lead mechanical engineer on the W86 development program from 1978 to 1982 and program manager with the Phase 1 & 2 Division from 1982 to 1987. From 1987 until his promotion, his work included EPW development, including Strategic EPW. He was project manager of the W61 EPW Development Engineering Program.

Bill has a BS in mechanical engineering from Auburn University and an MS in the same field from UNM. He was named a Distinguished Member of Technical Staff in 1987. He is a New Mexico Registered Professional Engineer.

He enjoys restoring old cars, fishing, and golfing. Bill and his wife Sally Kalemba (7214) have two grown sons and live in the SE Heights.

LEWIS NEWBY to Supervisor of ES&H Regulatory Assessments Div. 3201.

Lew joined Sandia in 1989 as a member of the Safety Engineering Division, where he was safety engineer for Orgs. 100, 400, 3700, 4000, and 6200 and the Safety Training Curriculum coordinator.

He has a BS in naval science from the US Naval Academy and an MS in aeronautical engineering from the US Naval Postgraduate School. Before joining the Labs, he served with the Navy at DOE Headquarters in the Office of Military Applications; his assignment was Office Director for ES&H, Safeguards and Security,



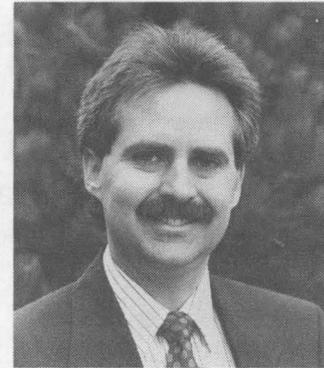
LEW NEWBY

Emergency Response, and Nuclear Weapons System Safety. He's a member of the American Society of Safety Engineers. During his Navy career, Lew was a pilot, commanded an aviation squadron supporting Atlantic Fleet aircraft carriers, and was Executive Officer of the USS Guam.

Lew enjoys golf and camping. He and his wife Sara have three children and live in NE Albuquerque.

PAUL McWHORTER to Supervisor of Microelectronics Technology Div. 2144.

Paul joined the Labs in 1984 as a member of the Failure Analysis Division, analyzing microelectronics fabrication and testing problems and studying radiation effects on microelectronics devices. From 1985 to 1989, he worked in the Nonvolatile Memory Technology Division, developing physical models to predict



PAUL McWHORTER

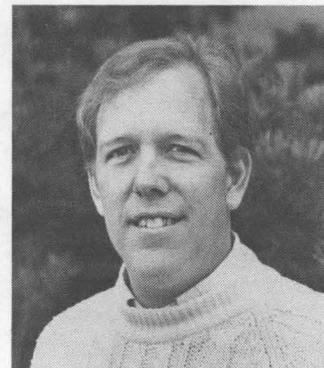
the performance of nonvolatile memories in harsh environments. He joined the Reliability Physics Division in 1989 and helped create Sandia's Microelectronics Quality/Reliability Center. The center is designed to improve world competitiveness of the US microelectronics industry by improving quality and reliability.

Paul has a BS in electrical engineering from the University of Texas and an MS from Stanford in the same field. He earned his masters degree through Sandia's Special Microelectronics Masters Program.

He enjoys woodworking and activities with the New Mexico Boys Ranch and Hoffmantown Baptist Church. Paul and his wife Anna Lee have one daughter and live in the NE Heights.

THOMAS BICKEL to Supervisor of Electronic Materials Applications Div. 6221.

Tom joined Sandia's Process Research Division in 1978, studying chemical reaction kinetics of direct-coal liquefaction. While there, he was on special assignment with the Strategic Petroleum Reserve project team. In 1980, he transferred to the Advanced Technology Division, doing laboratory-scale and field studies of



TOM BICKEL

in situ oil shale retorting. He also conducted geophysics research on secondary and tertiary oil recovery. He left the Labs for six months in 1980 to work at Vedette Energy Research Co. to commercialize the downhole steam generator.

From 1989 until his promotion, he was project leader of the high-temperature superconductivity STEPS (Superconductivity Technology for Electric Power Systems) program. In 1990, he was named a Distinguished Member of Technical Staff.

Tom has a BS in engineering science from Trinity University (San Antonio, Tex.) and an MS and PhD in chemical engineering from the University of Texas. He is a member of the American Institute of Chemical Engineers.

He enjoys woodworking and biking and is a National Association of Underwater Instructors assistant instructor of scuba diving. Tom and his wife Wendy have three children and live in NE Albuquerque.

News Briefs

Sandia Establishes Office at NMSU

Sandia President Al Narath and New Mexico State University President James Halligan signed letters of agreement last month that pave the way for increased cooperation between the two institutions.

Sandia will establish a liaison office at NMSU and will offer support for the university's graduate and undergraduate programs. The two institutions will also assist each other in research and development.

Sandia engineer John Otts will be the Sandia liaison at NMSU, helping to administer \$1.3 million in research grants already in place, and identifying additional common areas of interest and expertise.

New Treaty Verification System Evaluated

Verification Systems and Technology Dept. 9240 has developed and is testing an advanced seismic system for monitoring underground nuclear explosions.

The new system, called the Deployable Seismic Verification System (DSVS), has a high-frequency capability not available in earlier systems. It is the latest in a series that began with development of the National Seismic Systems (NSS), which were evaluated and used between 1980 and 1986 and found to be the most reliable seismic systems ever developed.

The DSVS is known as an "in-country" system, meaning it may be installed in a country that is party to a nuclear testing treaty with the US. The system would gather and relay seismic data to the US for analysis.

Many of the components of the DSVS will be used in monitoring the recently ratified Threshold Test Ban Treaty between the US and the Soviet Union.

Salt Domes Used to Store Natural Gas

Technologies developed by Sandia for oil storage are being used to store natural gas in a cavern leached out of a subterranean salt dome on the Texas coast.

Developed by Sandia to store oil in the DOE's Strategic Petroleum Reserve (SPR), the technology is now being used for the first time by private industry to store about 1.8 billion cubic feet of natural gas in an underground facility about 30 miles east of Houston.

Such salt domes have characteristics that make them excellent structures for storing hydrocarbons. The salt is relatively easy to hollow out, and its natural sealing qualities do not permit hydrocarbons to escape.

Sandia's role has been to qualify existing caverns for oil storage and to design new caverns and a system for retrieving the oil. But a cavern designed for natural gas requires a different configuration from one designed for oil storage, notes Jim Linn, Supervisor of Underground Storage Technology Div. 6257.

Tejas Power Corp. knew of Sandia's work on the SPR and approached the Labs in 1989 about serving as a geotechnical consultant on the underground storage cavern project.

Solar Facility Simulates Intense Heat

A field of 220 sun-tracking mirrors at the National Solar Thermal Test Facility (NSTTF) in Area III is being used to simulate the intense heat that can hinder the performance of missiles and other man-made structures as they travel through Earth's atmosphere.

Built in 1978 to generate solar power, the NSTTF ("power tower") is also being used for tests that require intense heat or the ability to direct high heat onto a small target. For instance, an 8-acre heliostat field at the NSTTF can be used to test the effects of heat on materials or components used in nuclear power plants.

Sandia recently simulated the reentry of an antenna array being developed by the US Air Force for the National Aerospace Plane.

In another project, researchers from Johns Hopkins University used the NSTTF to simulate the aerodynamic heating that occurs when a missile travels through the atmosphere. High temperatures caused by air friction can interfere with a missile's tracking system. Once the effects are characterized in detail, the guidance system can be programmed to make necessary adjustments automatically.

Solar heating has certain advantages over other heating techniques, such as laser irradiation, quartz heat lamps, or actual flight tests, says NSTTF Manager Chris Cameron (6215), because it provides an unobstructed view of the test object and no electrical interference such as might result from electrical heating.

feed back

Q: It seems that, especially in times of change, an important requirement of management is that it have the confidence of the managed. I propose a simple survey on this topic. It asks only two questions of staff (to be answered on a scale of 1 to 10, where 1 is "no confidence" and 10 is "complete confidence"):

1. For each level of management above you, how confident are you that the person in that job has the vision to define the organization's role in the "new" Sandia?

2. For each level of management above you, how confident are you that the person in that job will succeed in bringing about the changes in the organization to meet its new role?

Needless to say, survey results could not have binding value on management decisions, but might serve to give our managers a more accurate (and I suspect humble) assessment of their abilities, at least as they are perceived by staff.

A: Your suggestion is not out of line with current thinking on how we evaluate management performance at Sandia. This year, we began the first phase of Upward Feedback, a program to provide Directors and above with results of surveys done by people who report to them directly and people two levels below them. Phase 2 begins this year and will include Department Managers and Supervisors. The Upward Feedback system provides a lot of the objective feedback you are suggesting.

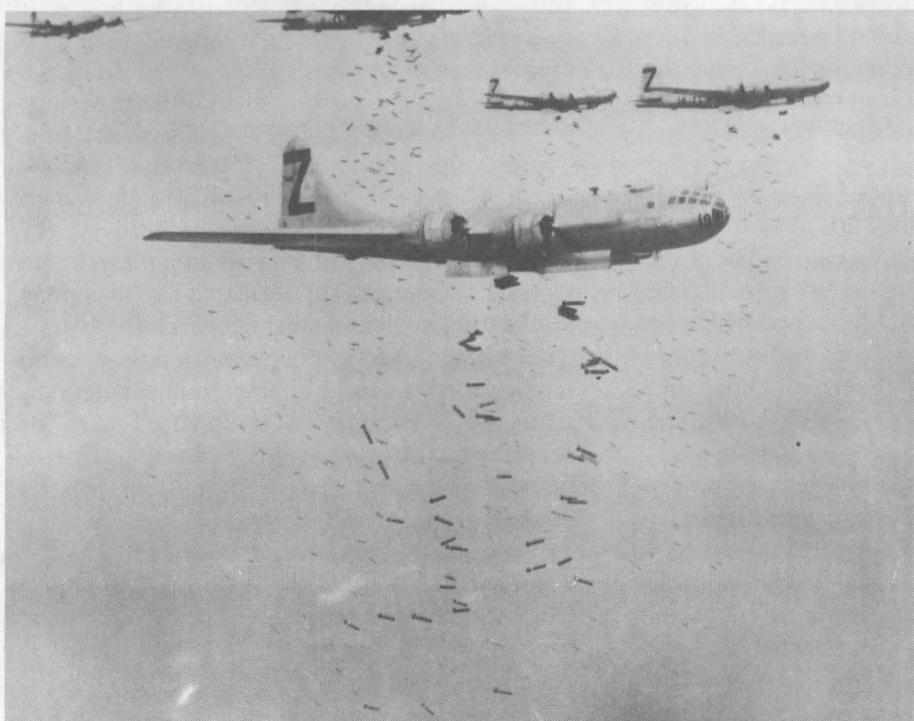
Also, starting this year, we are considering a formal, Labs-wide management assessment survey conducted by a professional organization, modeled after a similar, successful program at AT&T. The new survey will not only identify levels of management's effectiveness throughout Sandia, but will compare our results with those of other institutions around the country. The "new" Sandia you refer to will provide a much more open assessment of everyone's performance, as well as a more objective attempt to get useful feedback for management decisions and management effectiveness.

Dan Hartley (5)

Take Note

Toastmasters, a group that helps presenters develop and strengthen their speaking skills, meets on Kirtland AFB on Thursdays from noon to 1 p.m. For information, contact Michele Weiss, days or evenings, on 275-0593.

Favorite Old Photos

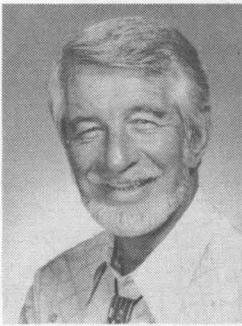


The recent Gulf War prompted Randy Maydew (420) to remember these old photos and his 30 missions over Japan as a navigator on a B-29 bomber (in action, left). Right: Randy's crew sits in a flak hole in the wing of its B-29 after a raid over



Tokyo on Feb. 19, 1945. Randy is the flyboy standing left of center with the lieutenant's bar on his cap.

Employee Death



CLYDE WALKER
(1981 photo)

Clyde Walker, of Safeguards Technology Development Div. 5243 died March 2 after a short illness.

He was 67 years old.

Clyde, a senior member of technical staff, joined the Labs in 1951. He designed Sandia's thunderbird logo in 1955.

Clyde is survived by his wife, son, daughter, two stepsons, and one stepdaughter.

Recent Patents to Sandians

Dave Benson (1512), Bob Bickes (2515), and Bob Blewer (2132): Tungsten Bridge for the Low Energy Ignition of Explosive and Energetic Materials.

George Arnold (1111), Carol Ashby (1126), and Jerry Brannon (1128): Controlled Ion Implant Damage Profile for Etching.

Joseph Maestas and Lyndon Pierson (both 2934): Cryptographic Synchronization Recovery by Measuring Randomness of Decrypted Data.

Sympathy

To Juanita Yepa (3426) on the deaths of her mother and grandson in Jemez Pueblo, Feb. 14 and Feb. 18.

To Patsy John (7821) and Paul Corken (2858) on the death of their father in Illinois, Feb. 25.

To Manny Silva (7821) on the death of his father in Albuquerque, Feb. 27.

To Robert Miller (3426) on the death of his mother-in-law in Gaithersburg, Md., March 6.

To Cindy Beer (5243) on the death of her father in North Dakota, March 7.



UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS

Deadline: Friday noon before week of publication unless changed by holiday. Mail to Div. 3162.

Ad Rules

1. Limit 20 words, including last name and home phone.
2. Include organization and full name with each ad submission.
3. Submit each ad in writing. No phone-ins.
4. Use 8 1/2 by 11-inch paper.
5. Use separate sheet for each ad category.
6. Type or print ads legibly; use only accepted abbreviations.
7. One ad per category per issue.
8. No more than two insertions of same "for sale" or "wanted" item.
9. No "For Rent" ads except for employees on temporary assignment.
10. No commercial ads.
11. For active and retired Sandians and DOE employees.
12. Housing listed for sale is available for occupancy without regard to race, creed, color, or national origin.

MISCELLANEOUS

- PORTABLE SPA, beige, 115 vac, sized for 5 adults, \$575. Tidwell, 275-0966.
- RELOADING EQUIPMENT, shotshell & brass, 1022 Ruger rifle, Marlin 22 rifle, H&R single-shot 12-gauge. Guthrie, 265-3555.
- SMITH & WESSON .357-MAGNUM, model 586 (L-frame), 6-in. barrel, nickel finish, target sights, \$300. Montoya, 296-4268.
- TICKETS: 1 round trip, Dallas/Albuquerque, departs May 24, returns May 26, male ticket holder, \$90. Schneider, 344-6626.
- TWIN/TRUNDLE BEDS, 2, ranch oak, dark finish, complete w/mattress & bunkies, \$300. Myers, 298-2677.
- CONTEMPORARY DRESSER, 9-drawer, off-white w/gold trim, \$85; 1985 Kenmore side-by-side refrigerator/freezer, white, interior ice maker, \$400. Greene, 898-2594.
- ONE CORD PINON WOOD, you pick up. Hayes, 299-1200.
- STROLLER, crib, car seat, bassinet, other baby items. Foty, 260-1747.
- COMPUTER EQUIPMENT: 80286, 640K, VGA adapter, & color monitor, hard disk controller (no HD), 1200-baud external modem, 3.5-in. drive, \$750. McCarty, 823-2926.
- FULL-SIZE MATTRESS, free. McBrayer, 293-4076.
- CAMPING TRAILER, Coleman Newport, mattresses, privacy curtains, \$2,000. Wenrich, 294-1006.
- RV FURNACE, Duo-Therm Model 90030, 30,000-Btu, some new parts, costs \$500 new, asking \$200 OBO. McKenney, 268-7390.
- MOVING SALE: toys, clothes, bath sink, countertops, electronics, stereo, low-profile tires, TV, miscellaneous, Saturday only (March 23), 8 a.m.-6 p.m., 2724 Valencia NE. Axness, 884-3524.
- LOVE SEAT, brown plaid, \$65; sleeper love seat, gold/green, \$110; 2 dinette chairs, blond finish, upholstered seats, \$8/ea. Henfling, 869-4119.
- GRACO BABY SWING, \$8; Cosco car seat, \$15; Fisher-Price high chair, \$20; Welsh crib/mattress, \$75. Sims, 298-6026.

- MAG WHEELS, 15x7, fit Ford, AMC, Dodge, 5 for \$125. Summers, 881-7765.
- LEATHER COUCH, Homestead House, cinnamon, \$750. Mitchell, 299-5144 after 3:30 p.m.
- HONDA 4KW GENERATOR, w/dolly, electric/manual start, unleaded gas, \$995. Benson, 268-9727.
- RIDING LAWN MOWER, Sears, 10-hp, used 3 times, \$850 OBO. Claussen, 293-9704.
- PA SYSTEM, 4-channel mixer w/graphic equalizer, 2 cabinets w/15-in. speakers & horns, \$650 OBO. Marquez, 344-8455.
- MG MIDGET WHEELS, RO-style, 5 for \$25; mobile home axle w/electric brakes, tires, \$125. Shaw, 296-2531.
- RECEIVER, speakers, turntable, records, \$225 OBO; Sylvania VCR, VHS, \$125 OBO; Commodore set-up, drive, monitor, printer, modem, software. Mazze, 299-4568.
- CHIHUAHUA PUPPIES: pocket-sized female, smooth coat, \$325; long-coat male, \$225; both champion-sired, health guarantee, first shots. Sargent, 865-3227.
- NINTENDO GAMES: "Bigfoot," "Cave-man," "Jaws," \$30/ea. Sturgeon, 281-9035.
- TRAVEL TRAILER, 35-ft. Jayco Anniversary Designer Special, queen-size bed w/box spring, walk-through bath & shower, awning, water purification system. Hatcher, 291-8839.
- ROTARY TILLER, 5-hp, Wards, chain drive, \$210. Christensen, 884-8249.
- MINIATURE DACHSHUND PUPPIES, AKC, male, black & tan, \$200. Puccini, 255-0568.
- WHEELS, 4, 5-hole, 14x6, from '81 Toyota pickup, includes hubcaps and lug nuts, \$50. Harding, 291-9449.
- YARD SALE: Saturday, March 23, 9 a.m.-4 p.m., 1609 Chelwood Blvd., furniture, toys, ski equipment, garden & auto stuff. Leeman, 299-9149.
- STARTER GOLF SET, Dunlop, woods (1,3,5), irons (1 through 9), Acushnet putter, Vagabond bag, \$75. Roth, 344-7060.
- FORMICA BATHROOM COUNTER-TOP, w/yellow sink, 24" x 56", medicine cabinet, 20" x 30", 2 smoked-glass mirrors, 32" x 48", 44-1/2" x 45", make offer. Mikkelsen, 881-3921.
- AT&T PC6300, 640K RAM, 2 floppy drives, 20MB hard drive, math coprocessor, EGA color monitor, \$1,000. Carter, 296-8210.
- HP-86 COMPUTER, monitor, clock, advanced-programming ROM, IEEE-488 interface, dual-disk storage, dot-matrix printer, \$400. Strasburg, 299-4214.
- GE DOUBLE OVEN, range, hood, and food processor, avocado, \$350/all or will sell separately. Cazzola, 884-7106.
- ACOUSTIC GUITAR, Epiphone, w/new hard case, \$225. Burns, 292-6396.
- OAK HOBBY BENCH, 3 drawers, 2 lights, \$199. Luther, 293-4462.
- DECK LUMBER, planks, posts, lattice, etc., stained, free, must take all, you pick up. Van Deusen, 291-8196 after 5 p.m.
- TOW DOLLY, Demco model KK260, 1987 model, new departure hubs, 2 sets straps, \$850; Scout II parts. Brooks, 299-1884.
- TRAILER, '89 Terry 295J, 29-1/2 ft., loaded, \$19,500. Westman, 881-0471.

- POT-BELLIED STOVE, wood- or coal-burning, Round Oak, approx. 100 yrs. old, 40" tall, best offer. Kindschi, 256-0531.
- 286 COMPUTER, 1P:2S:2G ports, 3-1/2" floppy drive, 360K 5-1/4" floppy drive, 44M hard disk, VGA display driver, 101 ATKB, mouse, 1 Meg. RAM, \$795. Hale, 298-1545.
- CENTURY PLANTS, locally grown, healthy, 5-in. to 15-in. diameter, \$5 to \$15. Bando, 292-2452.
- SCOTTS FERTILIZER SPREADER, 21-in., \$25; Sears 18-in. hedge trimmer, \$30; Ross deep-root feeder, \$10; horseshoe set, \$12. Pavelko, 296-3346.
- HIGH-BACK BUCKET SEATS, blue, 2, \$25/ea.; 16-ft. RV canopy, \$25; hydraulic engine puller "cherry picker," \$100. Gorman, 292-7119.
- RECEIVER/AMP, Technics SA-626, 65 w/ch., .005% THD, \$215 OBO; Technics SL-P220 CD player, w/remote, \$85 OBO. Tise, 275-0590.
- GOLDEN OAK DESK, double pedestal, \$250 OBO. Ramel, 821-0475.
- MATTRESS, queen-size, high-density, box spring, adjustable frame & wheels, used as guest bed only, \$200. Kern, 822-0535.
- WASHER/DRYER, Sears Heavy-Duty, harvest gold, \$275/pr.; Sears portable dishwasher, white, \$125; Sears riding mower, free. Pullen, 291-0666.
- POWER LAWN MOWER, 20-in. rotary, 3.5-hp Tecumseh engine, w/side-discharge grass catcher, easy start, \$80. Stang, 256-7793.
- PROVINCIAL BEDROOM FURNITURE: desk w/bookcase, vanity, chest of drawers, \$160; storage bench, \$65; TI Speak and Read, \$25; Levan, 293-0079.
- WALL GAS FURNACE, new; pedestal sink, w/fixtures; bathtub; toilet; make offer; free Funk & Wagnalls encyclopedias; patio door w/windows. Jennings, 255-5950.
- WURLITZER PIANO, \$800 OBO. Adams, 821-9079.
- MODULAR SOFA, six-piece, off-white. Resnick, 292-3825.
- WHITE WESTINGHOUSE REFRIGERATOR, 17 cu. ft., \$500; Panasonic 21-in. color cable-ready TV, w/stand, \$250. Griggs, 891-8604.
- IBM PS/2, Model 50Z, 30-Meg. hard disk, 5.25 and 3.5 floppy, mouse, Panasonic printer, VGA monitor, \$1,795; software also available. Larson, 255-8425.
- YAMAHA PSS-480 KEYBOARD, 100 pre-set voices, 100 pre-set rhythms, digital synthesizer, 1 yr. old, \$170. Garduño, 281-1116.
- EXERCISE BIKE, Ergometer, white, \$65. Matthewson, 883-6649.

TRANSPORTATION

- '88 CHEV. SILVERADO PICKUP, short-bed, 46K miles, loaded. Potter, 869-4716.
- '89 HONDA ACCORD LXi, Mercedes green, 5-spd., 2-dr., 32K miles, complete maintenance record, \$10,600. Schneider, 344-6626.
- '74 VOLKSWAGEN BEETLE, \$2,800. Prusak, 296-1571.
- REPOS: '85 Ford Ranger, 4x4, 5-spd., AM/FM stereo cassette, 86K miles; '90 Ford Ranger, 5-spd., AC, AM/FM stereo cassette, 18K miles; bids accepted through March 27; we reserve the right to refuse all bids, Sandia Lab FCU, 293-0500.

- '78 HONDA STREET MOTORCYCLE, Twinstar, 185cc, 3K miles, needs battery, \$400. Trever, 823-9418.
- '84 VOLKSWAGEN GTI, white, sunroof, 5-spd., alloy wheels, bucket seats, 4-speaker AM/FM cassette, 65K miles, \$3,900 OBO. Ricco, 828-1997.
- MAN'S 10-SPD. BIKE, Schwinn Le-Tour, 25-in frame, \$95. Summers, 881-7765.
- '90 CLASS A MOTORHOME, 28-ft. Fleetwood Southwind, 7K miles, below book. Johnson, 299-7199.
- '89 FORD TEMPO GL, transferrable warranty, 40K miles, 4-dr., AM/FM cassette, cruise, tinted windows, tilt, \$7,600 OBO. Cartwright, 836-6957.
- '78 DATSUN 280Z, black, extras, 117K miles, records, \$2,650. Nygren, 344-3332.
- '83 INVADER, 17-ft., w/stern drive, 145-hp Volvo motor, full canvas, Shoreline trailer, \$4,500. Childers, 344-9281.
- '70 DATSUN 1600, 2-seat convertible, w/hard top, needs paint, \$2,000 OBO; '83 Buick Regal, PS, PB, cruise, \$2,000 OBO. Black, 296-8414 or 296-3233.
- '80 FORD BRONCO, 4-WD, V-6, 4-spd., PS, PB, 67K miles, \$3,400. Rountree, 296-7268.
- '78 PORSCHE 924, Alpine white, 44K miles on '82 engine, AC, new tires, brakes, upholstery, stereo, extras. Dawson, 298-9508.
- '89 MUSTANG GT, all extras, sunroof, black, 43K miles, \$9,700. Setchell, 281-5600.
- FORD XLT LARIAT, 460, 42K miles, \$9,000. Westman, 881-0471.
- '87 HONDA MAGNA, 4K miles, extras, \$3,100 OBO. Burns, 292-6396.
- 12-SPD. ROAD BIKE, Schwinn Prelude, ice pink, 19-in. CrMo frame, Shimano, DiaCompe, & Sakae components, \$200. Spence, 268-7396.
- '83 MAZDA GLC, 5-spd, 60K miles, AC, \$2,100. Hansen, 265-3987.
- 10-SPD. BICYCLE, Bridgestone Aries steel frame, w/23-in. wheels, \$185 OBO. Schneider, 299-6243.
- '85 AUDI 5000S, metallic black, 5-spd., AM/FM cassette, AC, sunroof, cruise, extra wheels w/snow tires, 85K miles, \$4,100 OBO. Schindewolf, 281-9859.
- '79 CHEV. PICKUP, 2-WD, 9K miles on new 350 engine, \$4,000. Johnson, 292-4643.
- '89 KAWASAKI BAYOU ATV, 4-wheeler, red, 2-WD, 6 hours riding time, \$2,900 OBO. Chavez, 899-8695 or 884-7909.
- '86 THUNDERBIRD, 2-dr., one owner, \$4,700. Sturgeon, 281-9035.
- '86 MACH I CUDDY CABIN BOAT, 21-ft., 260 Mercury motor, camper top, trim tabs, \$12,000, will consider trade. Holovka, 299-4008 or 281-5518.
- '81 YAMAHA 850 MIDNIGHT SPECIAL, shaft drive, \$800. Guthrie, 265-3555.
- '80 VOLARE STATION WAGON, slant-six, AT, AC, 64K miles, \$2,400. Kish, 298-3963.
- '67 MERCEDES 250S, 4-dr., beige, re-conditioned engine, \$3,750. Bauer, 266-8480.
- '87 CONCORD MACH II BOAT, 20-ft., open bow, I/O, 260-hp, 49 hrs., tandem axle trailer, \$14,500. Stuart, 296-8188.
- '78 CHEVETTE, 4-dr., AT, AC, new battery & tires, 85K miles, \$500. Spatz, 299-0410.

- '70 VOLKSWAGEN BUG, AM/FM radio, 40K miles on rebuilt engine, \$1,900. Levan, 293-0079.
- '76 FIAT CONVERTIBLE, recently tuned, \$800 OBO. Morrison, 275-8053.
- '88 TOYOTA SUPRA TURBO, AT, removable roof, extended warranty, 21K miles. Hughes, 293-7320.

REAL ESTATE

- 3-BDR. BRICK HOME, 1-1/2 baths, 1,400 sq. ft., garage, carpeted hardwood floors, brick patio/BBQ, near Coronado, \$83,900. Axness, 884-3524.
- 5 ACRES ON NATIONAL FOREST, South 217, fenced, wooded, \$24,500, \$2,000 down, \$250/mo. Savage, 281-4651.
- 3-BDR. MODULAR HOME, 2 baths, 1,300 sq. ft., \$271.36 monthly; 1-1/3 acres land, South Valley, \$12,000 down, \$204 monthly. Flores, 873-4337.
- 4-BDR. HOME, 1-1/2 stories, near KAFB and University, family room, study, 2-3/4 baths, wrought iron. Hendren, 883-5070.
- NAVAJO LAKE LOT, 2.43 acres, electricity, \$2,000 plus title fees. Van Deusen, 291-8196 after 5 p.m.
- 4-BDR. HOME, 1-3/4 baths, remodeled kitchen, carpeted throughout, auto sprinklers, patio, utility room. Mills, 299-2130.

WANTED

- SEARS GARDEN TRACTOR, 1970 to 1980. Parker, 877-8525.
- HEWLETT-PACKARD 45 CALCULATOR, in good working condition; manuals & case. Haaker, 298-7415.
- GAS TANK for 1974 Land Cruiser FJ-40 (Jeep style). Summers, 881-7765.
- HOUSEMATE, to share 3-bdr., 2-bath home, swimming pool, washer/dryer, 2 blocks northwest of Louisiana & Candelaria, \$300/mo. Semonisck, 883-4212.
- SHELL for Mitsubishi pickup, short, wide-bed, 59-1/2" x 74-1/2" outside dimensions. Stuart, 345-6358.
- LASERJET PRINTER; Lotus 1-2-3 Ver. 2.01, w/manuals; for United Way-affiliated day care. Sobolik, 292-3959.
- TEENAGER FOR MISCELLANEOUS YARDWORK, must be dependable, w/own transportation, \$4/hr. to start, Candelaria/Wyoming. Maenchen, 298-9496.
- TREADMILL, in good condition. Spires, 275-3655.

LOST AND FOUND

- LOST: small silver hoop earring w/teardrop jewel, lost on March 7 inside or between Bldgs. 892 and 880. Pompeo, 266-7930.

SHARE-A-RIDE

- CEDAR CREST VANPOOL has openings, Frost Rd., N-14, Tijeras. Yelton (281-2893) or Burns (281-3922).



Coronado Club Activities

Tonight, the C-Club Manager Puts On His Best Bow Tie for Members

SAL'S SPECIAL — Tonight, March 22, the C-Club's General Manager, Sal Salas, has planned a special party for Club members. From 8 to 12 p.m., the much-requested Brown River Band will play your favorite dancing tunes. Menu items include deep-fried shrimp, prime rib, snow crab, steak Neptune, and poached halibut (all entrees two-for-one priced \$15.95). A glass of wine is included with every meal. Reservations recommended (265-6791).

LITTLE ONES, listen up! Saturday, March 23, is the date of this year's annual Easter Egg Hunt, starring the Easter Bunny, Loren Kahn's Puppet Theatre, and kids (parents, don't forget your cameras). The hunt begins at 9 a.m., and the puppet show goes on stage at 10:30. Kids, bring an Easter basket for gathering eggs, cookies, and candy. Free for member kids ages 1 to 10. No guests please.

GATHER THE KINFOLKS and come to the C-Club's family brunch Sunday, March 24, from

10 a.m. to 1 p.m. The usual selection of brunch goodies will be served, and adults get a free glass of champagne with their brunches. Cost is \$5.95 for adults (\$6.95 for guests), \$1 for children (4 to 12 years old), and free for toddlers. Make reservations please.

A BUNCH OF BRUNCH — Sunday, March 31, the C-Club features an extra-special Easter brunch menu from 10 a.m. to 2 p.m. Items include eggs, bacon, omelets, french toast, baron of beef, carved turkey with giblet gravy, baked ham, chicken drumettes, green chile stew, potatoes, puddings, cakes, salad, cobbler, and the list goes on. Cost is \$10.95 for adults and \$5.95 for children (toddlers under 4 years old eat free). Make reservations early.

MEET SOME SHARKS at April's meetings of the T-Bird Card Sharks, April 4 and 18 (always the first and third Thursday of each month), from 10 a.m. to 3 p.m. New members are welcome.

Fun & Games

Bowling — Big Brothers/Big Sisters will hold its 10th annual "Bowl For Kids' Sake" bowlathon on Sunday, April 7, at Leisure Bowl from 10 a.m. to 4:30 p.m. There will be bowling every hour; pick the hour that's best for you. The bowlathon raises funds to support the services provided by Big Brothers/Big Sisters. This organization matches "at-risk" children, usually from single-parent families, with a responsible adult who becomes a positive role model and a friend. For more information call 265-3599.

Biking — Bicyclists are invited to participate in the La Tierra Encantada race sponsored by the Triathlon Assault Club and Velo Simpáticas on Sunday, March 24, beginning at 9 a.m. on a course on NM Highway 6, west of Los Lunas. Events include the 18-mile Individual Time Trial (ITT); the Duathlon ITT and 4-mile run (one person); and the Team Duathlon ITT and run (two people). Entry forms are available at the Manufacturers Sports Outlet, the Bike Co-op, the Wilderness Center, and other sports shops. For information, contact Shane Cleveland on 268-0723 or Jennifer Buntz on 299-3437.

Archery — The Manzano Archery Club will host an animal-target archery shoot on Saturday, March 30, at the Manzano Archery Range. A novelty shoot is included. Registration is at 8 a.m.; first arrow is at 8:30. Registration fee is \$5/adult and \$2.50/youth under 14. The public is invited. Membership applications will be available for those interested in joining. For information, contact Dewey Reed on 265-2687.

Club members have noted that four-wheel-drive vehicles and cross-country motorcycles are being driven on Archery Range property and are damaging the range trails and property. The range is off-limits to these vehicles. Vehicles seen driving off established roads will be reported to the KAFB Security Police. The range is for members only.

Events Calendar

Events Calendar items are gathered from various sources. Readers should confirm times and dates of interest whenever possible.

March 22 — Harmolodic Band, music and poetry for the 21st century; 7:30 p.m., South Broadway Cultural Center, 848-1320.

March 22-23 — "The Boys Next Door," contemporary comedy/drama by Tom Griffin; 8 p.m. Fri.-Sat., 2 p.m. Sun.; Albuquerque Little Theatre, 242-4750.

March 22-23 — Flower Show, horticultural and design displays, educational exhibits, presentation of Japanese Flower Arranging by Ikebana International and the Bonsai Society; 10 a.m.-4 p.m. both days, Fashion Square (corner of Lomas and San Mateo NE), 296-6020.

March 22-23 — Willow Creek Craft Fair; 9 a.m.-6 p.m. Fri., 9 a.m.-5 p.m. Sat.; 1205 Lawrence Ct. NE (2 blocks east of Tramway & 2 blocks south of Lomas).

March 22-30 — "Rosencrantz & Guildenstern Are Dead," Tom Stoppard comedy about Hamlet's college chums who are hired to spy on him, Theatre-in-the-Making performance; 8 p.m. Fri. & Sat.; CenterStage, 260-0331.

March 22-31 — "De Donde?" by Mary Gallagher, thought-provoking play about US immigration policy set in a small town in the Rio Grande Valley on the US/Mexico border, New Mexico Repertory Theatre production; 8 p.m. Mon.-Sat.; 2 p.m. matinees Sat. & Sun.; KiMo Theatre, 243-4500.

March 23 — Latin American Extravaganza, presented by the UNM Continuing Education Division and Baila! Baila! International Dance Studios, Mexican and Latin cultures highlighted

through music, song, and dance; 7 p.m., UNM Continuing Education Conference Center (1634 University Blvd. NE), 265-1858.

March 26 — "Water Gardens," class about water garden possibilities in Albuquerque's climate; 7 p.m., Albuquerque Garden Center (10120 Lomas NE), 296-6020.

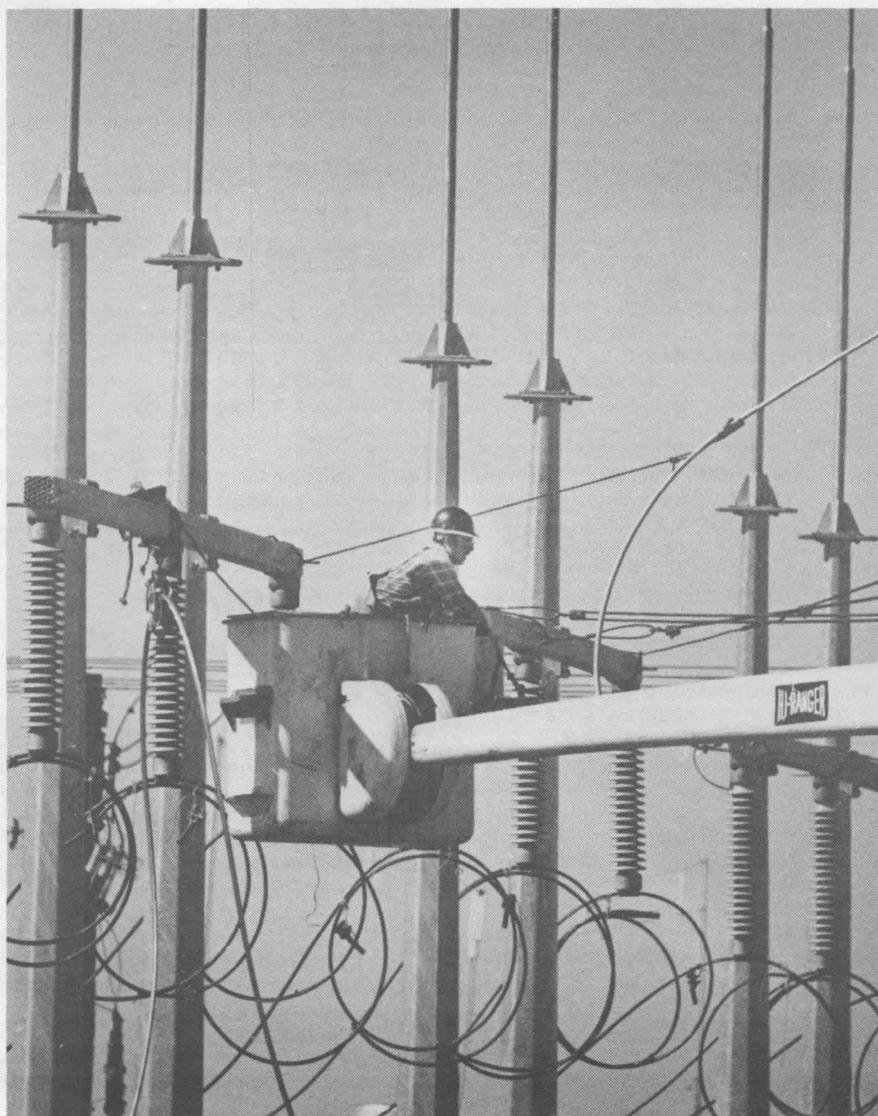
April 1 — Chick Corea Akoustic Band, Chick Corea on 9-ft. grand piano, Dave Weckl on drums, John Patitucci on bass; 8 p.m., Kiva Theatre, 255-9798.

April 1 — Monday Lecture Series: "Preservation of New Mexico Village Arts and Crafts by the Federal Government During the New Deal Years," by Suzanne Forrest, former Director of the Albuquerque Museum; 10 a.m., Indian Pueblo Cultural Center Theatre, 843-7270.

Take Note

A University of North Dakota alumni and friends reunion will be held Tuesday, April 9, at the El Pinto Restaurant at 6:30 p.m. Call Gay Dybwad (7411) on 296-9047 for reservation information.

Guy Trujillo of SunAmerica Securities, Inc., will present "What You Should Know About Retiring Before You Retire" on Wednesday, March 27, at the Coronado Club Eldorado Room at 5 p.m. Discussion includes estate planning, IRA rollovers, and retirement enhancement strategies. Please RSVP to Guy on 294-6655. Spouses are welcome.



TOWERS OF POWER — Mitchell Green (contractor) installs a new electrical transmission line at a transformer station north of Bldg. 957. Mitchell is dwarfed by his surroundings as he works high above the ground. (Photo by Randy Montoya, 3162)