

'Proving Its Safety . . . Will Require Considerable Work'

Fourteen-Year WIPP Veteran Wendell Weart Fields the Questions

During the past 14 years, Wendell Weart has seen the Waste Isolation Pilot Plant (WIPP) grow from a largely scientific investigation to a full-blown exercise in operations, where scientists play only a supporting role. Through it all — con-

troversy, headlines, the most minute study of a salt deposit in history — he has managed to keep his perspective and his sense of humor.

For Wendell, manager of Nuclear Waste Technology Dept. 6340, WIPP has been a full-time

pursuit since 1975. Even before that, he studied the Permian Basin's Salado Formation in connection with Project Gnome, a Plowshare underground nuclear test in the area. Wendell makes 50 to 80 trips a year in his efforts to manage Sandia's scientific studies at WIPP and to keep DOE and other government officials apprised of the progress.

Today, in addition to his increasing management responsibilities, he is often called upon to be an expert spokesman for the scientific aspects of the project — explaining the measurement of permeabilities or the intricacies of mineralogy to a variety of audiences. Recently, the LAB NEWS visited him at Sandia's WIPP site offices for this project update.

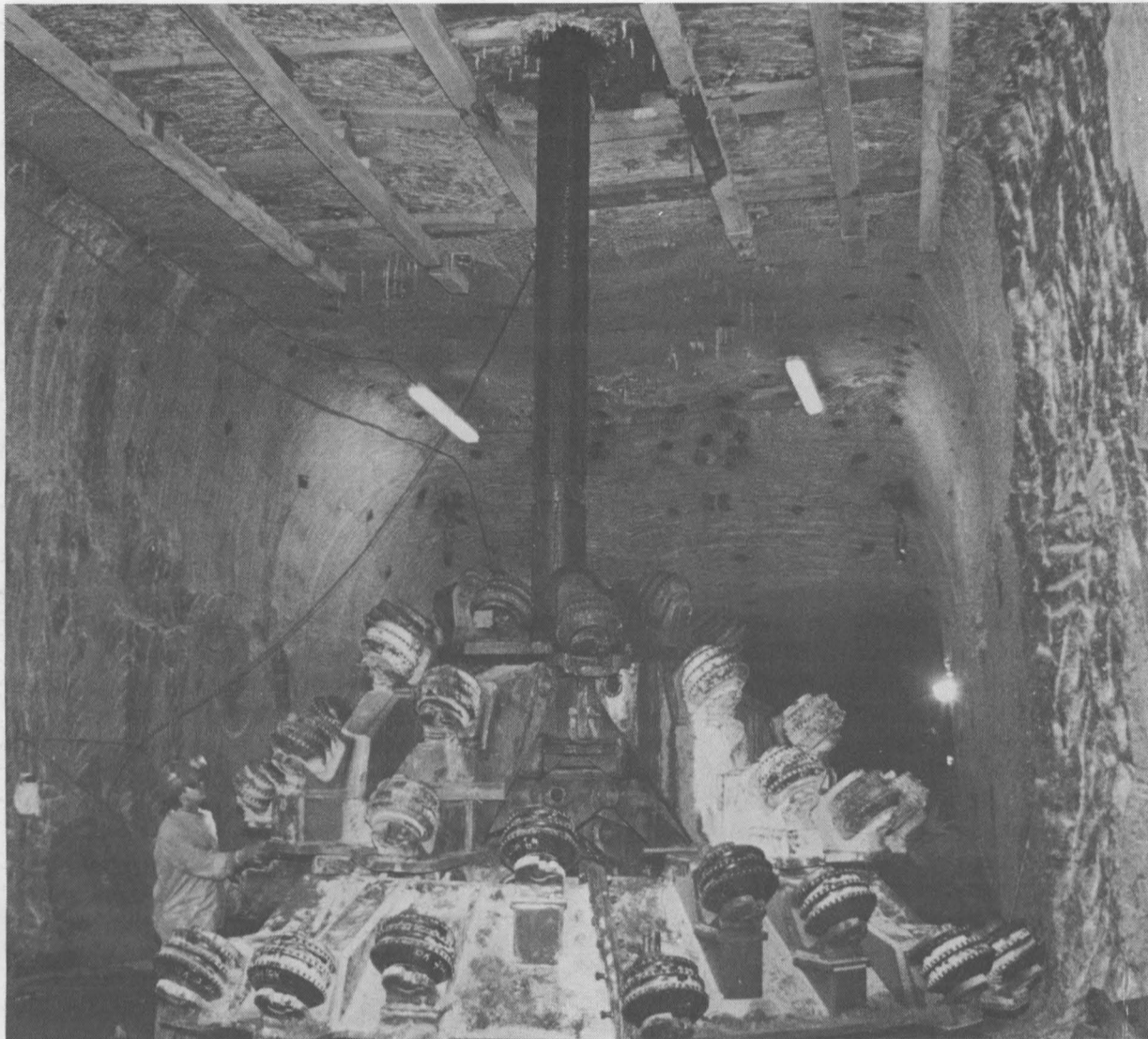
LN: Based on the evidence collected to date, do you think WIPP is a safe repository for transuranic wastes?

WW: Yes, I feel confident of that. Nevertheless, proving its safety in quantitative terms with respect to the Environmental Protection Agency [EPA] standard will require considerable work over the next few years.

LN: In a nutshell, what have you learned from experiments at the site so far?

WW: We've learned after extensive study that, geologically and hydrologically, salt provides as favorable an environment as we had hoped it would going into this work. Our site characterization work found no natural geologic or hydrologic processes that could breach the site for millions of years. As we got underground and observed the actual salt behavior, we had some surprises. The creep [movement] rate was more rapid than we had thought. But that is favorable in that it seals off the wastes even sooner. We observed more brine seepage than we had expected. But intensive investigation showed that it is a small enough

(Continued on Page Six)



AIR-INTAKE BORING SYSTEM — This 20-ft., 90,000-pound drill bit was assembled in a WIPP drift 2180 feet below the ground, then pulled upward to the surface to create the main WIPP air-intake shaft. (Westinghouse photo. More WIPP photos and stories begin on page six.)

WIPP: In a Nutshell

Where can we safely and permanently store more than four decades' accumulation of radioactive waste from America's national defense program? The Waste Isolation Pilot Plant (WIPP) is intended to answer that tough question.

The construction and operation of WIPP as an R&D project was mandated by Congress (Public Law 96-164 enacted in 1980) after reviewing years of research into possible storage solutions. Salt beds were chosen from among several solutions because of their occurrence in geologically stable areas and the tendency of salt to act as a sealant. In support of DOE, Sandia began surface investigations at the 16-square-mile site, 26 miles east of Carlsbad, N.M., in 1975. What was then seen as a two- to three-month study for a \$70 million project has turned into a 14-year effort to build a repository that will cost more than 10 times that amount.

Today WIPP includes 234,000 square feet of permanent building space and shops, and 10 million cubic feet of underground tunnels carved from a solid layer of salt 2150 feet below the desert. The project employs 646 workers, including about 60 Sandians.

When it is completely filled — about 20 years after its opening — WIPP is expected to permanently store 6.3 million cubic feet of contact-handled transuranic wastes and another 170,000 cubic feet of remotely handled transuranic wastes.



LAB NEWS

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RETIRING AT&T Technology Systems President Tom Thomsen (right) was honored at Sandia's Board of Directors' meeting Dec. 18, while Morris Tanenbaum (left), Chief Financial Officer of AT&T and Vice Chairman of AT&T's Board, was welcomed to the Sandia Board. Upon Thomsen's Dec. 30 retirement, Sandia President Al Narath (second from left), reports to Tanenbaum, who replaces Thomsen on the Sandia Board. Al Chernoff (second from right), Director of the DOE/AL Management Support Div., presented Thomsen with a DOE plaque honoring him for contributions during his six years on Sandia's Board. Chernoff has oversight responsibilities for AT&T's Sandia contract.

This & That

WIPping Through the Holidays - Hope you find time over the holidays to read the Waste Isolation Pilot Plant (WIPP) stories in this issue. Sandia has had - and continues to have - a substantial role in WIPP planning/testing and in the scientific analysis of project issues. We're trying to shed some rational light on a project that's had more than its share of controversy and misinformation. WIPP seems a classic example of a project that nearly everyone (at least in New Mexico) has an opinion about - even if the facts aren't known. While the stories - written by Will Keener ("WIPper Will," we call him) of Public Information Div. 3161 - don't cover every issue, they're a good "primer" - an opportunity to get some hard facts that aren't always readily available elsewhere.

* * *

Let's Not Make Ashes of Ourselves! - Two secretaries putting in some evening overtime in Bldg. 891 and a custodian may have prevented a serious fire several weeks ago, says fire protection engineer Dennis Kirson (7816). The secretaries smelled smoke and alerted the custodian, who traced it to a large plastic trash can in the building hall. Someone apparently dumped live ashes into the trash, igniting wastepaper in the can. The custodian, who immediately moved the can outdoors, said the papers were probably minutes away from bursting into open flame.

* * *

Camdia, Saudia, Sankia - Recent examples of Sandia name and address foul-ups on correspondence addressed to employees: Camdia Nt1 Lab (to Paul Beck, 9216), Sandia Ant Labs (to Paul Klarer, 5267), Scandinavia Nat Labs (to Gil Herrera, 2174), and - believe it or not - Saudia Arabian Airlines (to unidentified employee). Doug Lawson (9011) sent an address label from mail he received several years ago - Sankia International Laboratory (I think that lab studies coffee beans). Sandians at Livermore get their share, too. Richard Jones (8441) sent two examples: One was addressed to R. L. Jones, (8441), Livermore, VA 94550 (no address, street, or company, and wrong state); the other one was addressed to R. Jones, ESA Sandia National Lab, P. O. Box 769, Vermore, CA 74550 (wrong box, wrong city, wrong zip).

Postal-service bashing is a popular pastime, but - as I've said before - the postal service and our own mail-service folks probably don't get enough credit for the many things they do so well, such as delivering mail that's very badly misaddressed.

* * *

Why Kan't They Spel? - Borrowing a line from my favorite humor columnist, Dave Barry, "I am not making this up." I heard this cheer (or something very close to it) at a high school football game this fall:
R-O-W-D-I-E, R-O-W-D-I-E,
Every-body get Row-dy,
Let's Get To It!

* * *

Ties That Bind - Question and answer from *What Are The Chances?* by Bernard Siskin, Jerome Staller, and David Rorvik (Crown Publishers, Inc., New York). Q. "Is there any risk in wearing a necktie?" A. "Yes, and you don't have to hang yourself with one to be at risk. Researchers at Cornell University conducted a study showing that 66 percent of all businessmen wear their ties too tight; 12 percent wear them so tight they actually diminish blood flow to the brain, diminishing cerebral function." My boss always wears a tie. I wonder . . .

•LP

From Pace's Place

Sandians and Soviets on Cable TV

Four Sandians will appear briefly in an unusual cable television program on Christmas Day and again Dec. 30. The program, "Homeland," which will appear on the Discovery channel and simultaneously on Soviet Channel 1, portrays lifestyles in the US and USSR in an attempt to foster mutual understanding.

The Sandia connection started by chance when Stan Odle, who runs Broadcast Video Communications near Seattle, met Rance Edmunds (9132), who sat next to him on an airline flight from Seattle to Los Angeles. Odle was taken with the idea of taping segments at Sandia and called the Public Information Division (3161) on March 23 to ask permission to bring a joint US-Soviet production team to visit. When this proved difficult, and when production time was running out, Odle sent out a Mayday call at the end of April.

Serendipity intervened again. Pace VanDeventer (1200) was hosting a group of Soviet pulsed-power scientists at his home on May 1. Result: Odle, his Russian counterpart Alexander Andreev, and their technicians were invited to the party, where they recorded a spirited discussion about the "government of science."

Odle chose parts of this to close his Christmas Day "Homeland" segment, which juxtaposes life in Leningrad with the considerably different life of north-central New Mexico.

Sandia participants are Pace, Ray Leeper (1234), Juan Ramirez (1245), and Doug Bloomquist (1266). Soviet participants are I. Rudakov and V. Smirnov of the I. V. Kurchatov Institute of Atomic Energy, Moscow; and V. M. Bystritskii, Institute of High Current Electronics, Siberian Branch of USSR Academy of Sciences, Tomsk. Air times are 9 p.m. MST Dec. 25, and 6 p.m. MST Dec. 30.

Take Note

Stephen Passman (6212) has been elected to membership in the Johns Hopkins University Society of Scholars. The Society was established in 1967 by the University's Board of Trustees to honor former postdoctoral fellows who have distinguished themselves in scholarly or professional areas.



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US SENATOR JEFF BINGAMAN (left) talks with Executive VP Lee Bray (30) before a recent Sandia colloquium. Nearly 500 Sandians heard Bingaman discuss challenges facing the Labs and New Mexico in the 1990s. Bingaman called for a broadening of Sandia's mission to include more work in environmental clean-up, arms-control verification technology, and technology transfer. Rapid change is making it necessary "to determine which of our existing resources can be redirected and which will have to be dismantled," he said. He asked Labs employees to "give attention to what you can do and let people know where we need to invest our efforts."

Plus \$2100 in Pennies

LEAP Sets Record With \$152,548

Once again, Sandians participating in the Livermore Employees Assistance Plan (LEAP) have pledged a record amount for charitable organizations. This year's total is \$152,548, which tops the goal by \$548.

LEAP chairperson Carol Verity (8535) says employees not only surpassed the goal in pledges, they also contributed an additional \$2100 in pennies to be used in purchasing toys for needy children. The pennies came from the LEAP-Weigh campaign, which promoted friendly competition among directorates to see which could collect the most pennies (determined by weighing) before the LEAP kickoff in October.

Carol also points out that the number of participants in LEAP this year increased by 10, to 877 employees — 83.8 percent of Sandia, Livermore, employees. The average pledge was nearly \$174, and 290 people pledged a "Fair Share" of one hour's pay a month.

Sandians' contributions will go to some 30 local, Bay Area, and national human-services charitable organizations. The annual LEAP fund-raising drive has been conducted by employee committee since 1969.



LEAP-WEIGH TOYS — and other gifts — will turn 1200 pounds of pennies into a better holiday for needy children. Shopping for \$1000 worth of toys in Hayward are LEAP-Weigh committee members (from left) Renee Haynes (8531), Thomas Harrison (8451), Jane Ann Lamph (8442), Debbie Post (8162), Patty Carothers (8273), Joanne Lombardi (8271), Barbara Carter (8270), Glenda Muir (8451), and Sandy Ferrario (8161). LEAP-Weigh originator Thomas Harrison reports that eight local charitable agencies will receive gifts, including \$1400 worth of new toys and \$700 in cash grants.



Close Enough to Hear Firing

Sandian and Family Surprised by Philippine Coup Attempt

Lorenzo Asia (8272) didn't count on an insurrection in his homeland when he returned to the Philippines recently to attend his mother's funeral, but he found himself uncomfortably near some of the fighting while staying with in-laws in a Manila suburb.

Lorenzo and eight other family members flew to Manila Nov. 21 after the death of his mother. They drove about 250 miles to the family home in a northern province and stayed through Nov. 27 for the funeral.

On the 28th, Lorenzo, his wife Evelyn, and their 10-year-old son drove back to the Manila suburb of Cubao, Quezon City, to visit Evelyn's sister and family for a few days. When rebel troops fired on the presidential palace and took over several military installations Dec. 1, Lorenzo and his family felt that they were in the middle of the uprising.

Two government military camps are about a mile from where Lorenzo and his family were staying, he says, and rebels mounted a three-day



TWO HEADLINES about the coup attempt in the Philippines are displayed by Lorenzo Asia (8272) and Sherry Angelini (8531).

assault on the camps. Even though the neighborhood wasn't touched directly by the fighting, gunfire, bombs, and aircraft strafing ground troops could be heard day and night. Residents were advised to stay inside, which Lorenzo and other family members did. "I went outside the apartment building just once, to watch the military aircraft firing," says Lorenzo, "but I didn't want to be any closer to the action than that."

On Monday night, Dec. 4, they heard on television that international flights from Manila had resumed. The earliest plane reservations they could get were for the next day at 5 p.m.

Call From AT&T

Meanwhile, AT&T had been in touch with Sherry Angelini, in Physical Security Div. 8531, to ask whether any Sandia employees might be stranded in the Philippines. Because Lorenzo, through his supervisor, had notified Sandia security of his plans to leave the country, AT&T learned about him and his family being there.

(Sherry explains that any Livermore employee leaving the US, whether for business or personal travel, should notify Kelly Oetken [8531] in advance. At Albuquerque, the contact is Tim Lucero [3437], for any travel to a sensitive country or travel that will involve discussions of a DOE-sensitive topic.)

It was fairly easy, with the help of Lorenzo's sister-in-law Grace Petines (8156), to locate him. A member of the AT&T corporate security staff in the Philippines called Lorenzo at his in-laws' apartment to offer assistance and be sure his flight home was confirmed.

Detour Around Rebels

Driving to the airport on Dec. 5, Lorenzo and his relatives had to detour around the Makati financial district, where rebels were still in control. Many government troops were on guard at the airport. Lorenzo and his family had to go through several baggage checks and a pat-down search before boarding their flight for the trip back to the US.

Lorenzo returned to work Friday, Dec. 8, still tired, but glad to be back home. "My wife was frightened the whole time," he says, "and my young son has quite a story to tell his classmates."

Lorenzo and his wife came to the US 19 years ago. He has worked at Sandia the past 11 years and lives in the Stockton area. ●BLS



VP JOHN CRAWFORD (8000) addressed Sandia employees at an appreciation luncheon recently to commend them for their work over many years in the Vineyard hardware and weapon-component development programs. "It was really an evolution in scientific understanding of a very basic part of the mission of this laboratory," he said. "I know of no other program in this lab that spanned the breadth of discipline and technology that the Vineyard program did." Seated: Rick Wayne, Director of Component and Systems Research 8400.



Tapp and Powell Are Newest Directors

Sandia's two newest directors are Charles Tapp, Director of Development Testing 7500, and James Powell, Director of newly created Radiation Effects and Testing 9300.

Charles joined Sandia's Radiation Physics Division in 1964, studying radiation effects on semiconductor devices. In 1966, he was promoted to supervisor in the Neutron Generator Department; in August 1969, he was promoted to head that department. From 1978 to 1982, Charles headed the Telemetry Department at Sandia, Livermore, and in August of 1982, he returned to Albuquerque to head the Telemetry Department.

"Test activities in 7500 support all areas of Sandia," says Charles. "This organization has a history dating back to the Labs' earliest days, and



JIM POWELL (9300)

a proud record of getting the job done for the customer. The cost of maintaining test capabilities has gone up, increasing the price to our customers. This has driven away a lot of our business. We are starting a vigorous program to reduce costs and increase our ability to satisfy our customers. We want to be the most cost-effective, customer-oriented test organization in the world. I think we have the people and the facilities to do that."

He has a BA in philosophy from Union University, a BS in physics from Memphis State University, and an MS and PhD in physics from the University of Virginia. Charles is a senior member of IEEE.

He enjoys skiing and photography. He and his wife Fran Billings have a son and a daughter. They live in the NE Heights.

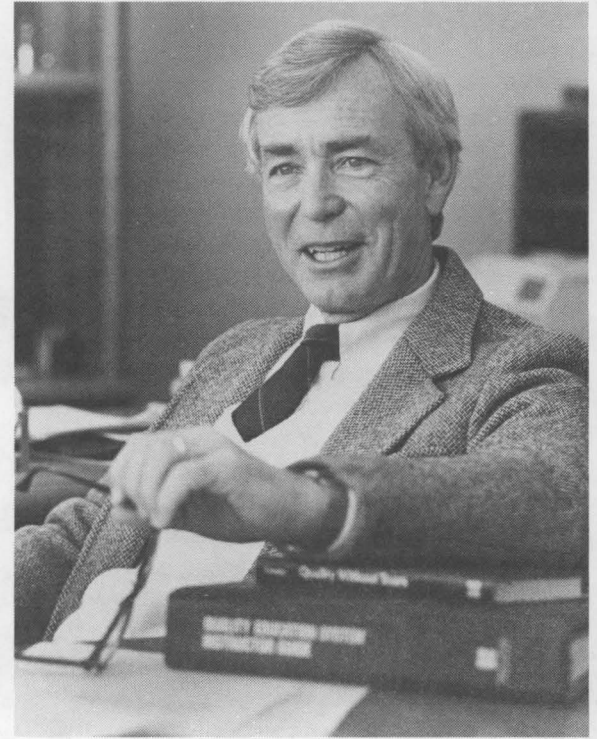
Jim Powell joined the Labs in August 1969 as a member of the Weapons Effects Simulation Division. He was promoted to supervisor of the Laser Plasma Physics Division in 1972, and later headed the Radiation Physics and Reactor Safety Division. In October 1979, he was appointed manager of the Simulation Technology Department.

"Organization 9300 has a very broad spectrum of responsibilities: coupled electron-photon transport-code development, accelerator operations, data acquisition and diagnostics development, and aboveground and underground effects testing. We also have oversight responsibilities for the manufacture and fielding of arming and firing devices," says Jim. "Our people are extremely competent and have many years of demonstrated excellence. I am really looking forward to the challenges that the 1990s will bring to our new organization."

Before joining Sandia, Jim worked on safety aspects of reactors for Argonne National Laboratory and Phillips Petroleum Co.

He has a BS in physics and mathematics from Texas Christian University and an MS and PhD in nuclear engineering from Texas A&M.

Jim is active in his church and enjoys various outdoor activities. He and his wife Carolyn live in the NE Heights. They have three grown children.



CHARLES TAPP (7500)

feed **li**back

Q. With so much construction going on at Sandia, Albuquerque, I notice a large number of junipers being used in the landscaping. Last spring, the Albuquerque Journal carried a story on the front page about the large number of people allergic to junipers. Is there a possibility of planting other types of shrubs — ones not as likely to irritate so many employees?

A. Almost every landscaping project at Sandia, Albuquerque, includes junipers of one variety or another. They are attractive year-round, require little maintenance, and are readily available.

Like a lot of other folks, I am also allergic to them, but there are so many around that a few more shouldn't make much difference. I suspect that some people would be allergic to juniper alternatives as well, but we will keep your concern in mind when designing future landscape projects.

Ward Hunnicutt — 7800

Q. Does any mechanism exist for organizations that receive more interoffice mailing envelopes than they can use to recycle them in some way? I've been told that JIT doesn't want used envelopes — because they're not new — and that Reclamation and the Mailroom have no way of recycling them and don't want them. I throw away at least one wastebasketful of envelopes a day because nobody wants them; many of the envelopes have been used only once or twice. In this era of cost-consciousness, can we find some way to redistribute things like envelopes, or is it really more cost-effective for Sandia to keep throwing them away and buying new ones?

A. Currently, Sandia does not have a mechanism for redistribution of excess interoffice mail envelopes. We studied the economics of recycling interoffice envelopes in the past and determined that such a program would be cost-prohibitive (that is, the cost to implement is significantly greater than what the envelopes cost).

We will continue to review this area periodically. When we reach the point where it becomes more efficient/economical to recycle, we will consider implementing a recycling program. In the meantime, some organizations have been able to reduce excess envelopes by placing a central "drop-off/pick-up" box in their building; thus, building occupants can drop off excess envelopes or pick up extras.

Paul Stanford — 100



JANE LIGHT (second from right), wife of Sandian Ron Light (2130A), who was seriously injured last spring when run down by a car during the family's evening walk, visited the Labs recently to accept a check combining funds collected at Sandia and proceeds from a block sale in the Lights' neighborhood. The check, totaling \$24,703, will be used to help defray living expenses of Jane and her son in Dallas, where they are staying while Ron is being treated at the Baylor Rehabilitation Hospital. Approximately half the funds presented to Jane were raised at the block sale; the remainder was contributed by Sandians to the Ron Light Fund at the Credit Union, which is continuing to accept contributions. Here, Jane shows pictures of Ron at the hospital to some of his co-workers: (front row, from left), Melanie Tuck (2134), Don Davis (2131), Jane, and Elaine Buck (6224). Back row: Paul Dressendorfer (2144), Carolyn Matzke, and Kay Manzanaras (both contractors).

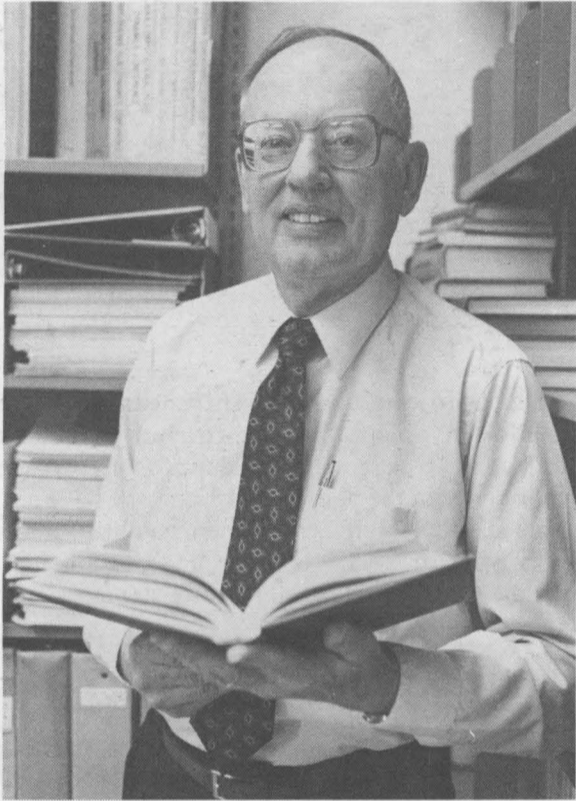
AIAA and IEEE**Fred Blottner and Dave Myers Named Society Fellows**

Two Sandians were recently elected Fellows of professional societies: Fred Blottner (DMTS, 1556) in the American Institute of Aeronautics and Astronautics (AIAA), and Dave Myers (1141) in the Institute of Electrical and Electronics Engineers (IEEE).

Both Fred and Dave are joining a select fraction of the two societies. Less than two percent of each group's members are Fellows.

Computation for Reentry Vehicles

Fred — who will be inducted at the national annual meeting May 3 — is being cited for exceptional contributions to the development of computational techniques for high-speed viscous flow,



FRED BLOTTNER (DMTS, 1556)

particularly boundary layers and multicomponent, chemically reacting gas mixtures.

"Much of this work was motivated by Sandia's reentry-vehicle work over the years," says Fred. "It's an area of fluid mechanics that's different from aircraft, which move at lower speeds without much happening in the air chemically. At a reentry vehicle's speed, enough heat is generated that chemical reactions occur."

The computer codes that Fred developed have also been used by NASA and aerospace companies, where the codes provided input for design of space-program vehicles. "For instance," says Fred, "one code predicts electron densities, which is useful information relating to 'blackout' of communications during a spacecraft's reentry."

Fred joined Sandia in 1954 and worked in rocket aerodynamics and wind tunnels until 1959, when he left to obtain a PhD. His 1962 dissertation

was an early contribution to the foundation of computational fluid dynamics; he started extending it into a general code for chemically reacting boundary layers while employed at General Electric from 1962 to 1966.

Fred returned to Sandia in 1966. In addition to aerodynamics, he has worked on problems such as gas dynamics of isotope separation, the interaction of a high-intensity laser beam with metal surfaces (such as occurs in welding), and the interaction between nuclear-reactor core material and a concrete floor.

Ion Implantation

Dave is being cited by the IEEE for pioneering the development of ion-beam modification of strained-layer superlattice and quantum-well, compound-semiconductor materials for novel electronic and optoelectronic devices. He'll be inducted as a Fellow at the local IEEE section meeting early next year.

Dave was the first to produce an electronic device — his was a photodetector — by ion-implantation doping in a strained-layer semiconductor. Ion implantation is a technique of placing atoms in solids by accelerating the atoms so they become embedded when they strike the solid; it's a way of giving semiconductors desired electrical properties. A strained-layer semiconductor — SLS — is an artificially structured material in which different types of

Research VP Comments

"I am delighted that Fred and Dave have been elected fellows of the AIAA and IEEE, respectively. This is a high honor. They both have done truly outstanding work in their fields, which has brought credit to them, their profession, and Sandia. My congratulations go to them on this recognition by two of the nation's leading professional societies."

Venky Narayanamurti (1000)

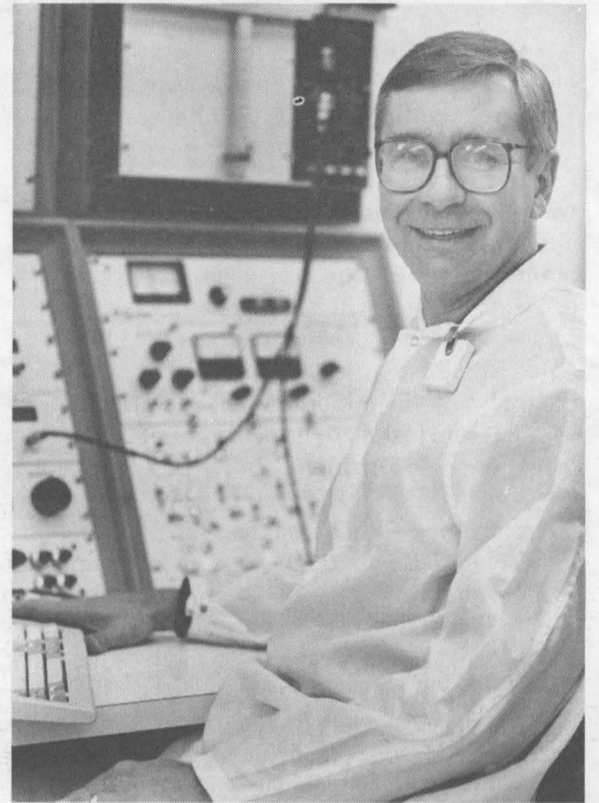
crystalline materials are grown one on top of another, in layers so thin that atoms of different materials align by elastic strain; SLSs are one type of heterojunction semiconductor, or semiconductor created by growing layered structures of different materials.

"Many people thought," says Dave, "that because of the strain in strained-layer systems, they would spontaneously decompose if you tried implantation. The fact that strained-layer materials could be implanted to make devices was important because it showed that the strained layers were stable, and also because we can now make a lot of novel electronic and optoelectronic devices by implanting strained-layer systems."

Dave points out that ion implantation can make areas of a single semiconductor surface elec-

trically different from each other, thus providing an alternative to the older method of creating electronic devices by etching away parts of the surface. "With heterojunction materials," says Dave, "plus ion-implantation techniques, we can optimize the device structure in ways that weren't possible a decade ago."

"Sandia — the 1100 organization in particular — has a strong background in developing ion-beam



DAVE MYERS (1141)

technologies, particularly for semiconductors," Dave continues. "It was a unique coincidence that a place with that expertise had also pioneered strained-layer work. I was able to exploit both those capabilities of the Labs and do something that no one had done before."

The theory underlying strained-layer superlattices was developed by Gordon Osbourn (1145), who received the E. O. Lawrence Award in 1985 for the accomplishment.

Professional Service, Too

Both Fred and Dave have volunteered time and effort to the societies honoring them, one of the considerations involved in the election of Fellows. Fred served as committee member or chairman for several conferences, and was general chairman for a computational fluid dynamics conference. He's a member of the AIAA Publication Committee.

Dave has served as chairman and member of conference committees. As short-course chairman for the International Electron Devices Meeting, he pioneered the videotaping and distribution of IEDM short courses. ●

Sympathy

To Thisbe (2545) and Don (3432) Jerome on the death of her mother and his mother-in-law in Kuna, Idaho, Nov. 19.

To Lorene Adams (3426) on the death of her mother in Ft. Worth, Tex., Nov. 20.

To Dan Pritchard (5238) on the death of his mother in Battle Creek, Mich., Nov. 20.

To Gilbert Quintana (5245) on the death of his grandfather in Las Cruces, Nov. 23.

To Laura Sanchez (9311) on the death of her father in Albuquerque, Nov. 29.

To Connie Tilgner (6342) on the death of her mother in Oregon, Dec. 1.

To Iona (2612) and Del (2852) Klinetobe on the death of her brother and his brother-in-law in Anthony, Fla., Dec. 2.



VISITING US SENATORS and staffers recently toured Area IV's Saturn facility, guided by Pace VanDeventer (1200, right). Shown are (from left) Peter Lennon, Professional Staff Member, Senate Appropriation Committee, Subcommittee on Defense; Sen. Pete Domenici (NM); and Sen. Ted Stevens (Alaska). Pace also briefed the visitors about Sandia's work in the Strategic Defense Initiative, and Bob Clem (9100) briefed them on targets, threats, and countermeasures.

(Continued from Page One)

Wendell Answers WIPP Questions

quantity — less than one percent of the original room volume — that it will not lead to the formation of a waste slurry. As I've been quoted elsewhere, if we can't do it [store transuranic wastes] at WIPP, it's unlikely we can do it anywhere.

LN: When will WIPP open?

WW: Secretary of Energy Watkins has said only that WIPP will not open before July 1990. We have no official date yet for a number of reasons. The DOE must obtain a permit from the EPA to place mixed wastes in the repository. [Mixed wastes contain radioactive and hazardous materials.] This permit involves petitioning the EPA to grant a "no-migration" variance. [By giving evidence that wastes will not migrate from the repository and present a danger to humans, DOE will be able to dispose of the hazardous materials and comply with the mixed-waste regulations.] The EPA has said that April is the earliest it can rule on the no-migration petition.

Another issue is the need to withdraw land for the repository. Either Congress must enact withdrawal legislation or the land must be administratively withdrawn by the Department of Interior for use by the DOE. [WIPP is located on Bureau of Land Management acreage, which gives the Interior Department jurisdiction in the matter.]

A Safety Analysis Report, describing facility operations, must be completed before the opening. And the DOE must complete work on a draft Supplemental Environmental Impact Statement [SEIS] that was published this spring and was the subject of public hearings during the summer. According to the stipulations of the National Environmental Policy Act, the DOE must respond in a final SEIS to all comments made at the hearings, and Admiral Watkins must then issue a record of decision on how to proceed with WIPP. That decision is not expected until February at least.

The State of New Mexico must also formally designate the routes to be used for transporting the waste within the state. This is expected to take until June 1990. So, even if you consider the opening of WIPP to be that time when we begin taking in wastes for our five-year experiment plan, there are a lot of steps yet to be taken.

LN: What will experiments during these five years accomplish?

WW: A recent review by a National Academy of Sciences expert panel emphasized the need to begin scientific experiments using actual transuranic wastes. These studies will improve our understanding of how the underground environment will interact with large-scale waste emplacements. This information, in turn, will be input to our performance assessment work [see "Performance Assessment"]. These studies are separate from the DOE/Westinghouse plan to use wastes to demonstrate the operating capabilities of WIPP. The most recent DOE description of all the scientific studies to be done during the next five years is to be issued this month. It is expected to reflect a consensus opinion that operations-demonstration activities be considered separately from the experiments.

LN: What about the problem of gas buildup?

WW: The key concerns are that pressures might become high enough to cause fractures in the host rock and that more adverse consequences could result in the event of human intrusion. The EPA mandates this hypothetical intrusion be evaluated. Drilling into the pressurized room could re-



SALT OF THE EARTH — Wendell Weart has spent the past 14 years as manager of Sandia's Nuclear Waste Technology Dept. 6340 studying the crystalline salt of the Salado Formation and watching WIPP grow from a plan on paper to a \$750 million pilot project in the New Mexico desert.

sult in radioactive material being injected into the Rustler aquifer [above the Salado Formation] or being forced to the surface.

LN: Where do the gases come from?

WW: The primary purpose of the experiments using actual radioactive waste is to get a realistic handle on gas generation. Most of the gas will be caused by bacterial action on organic compounds in the waste or by corrosion of metal. The principal gases are carbon dioxide and hydrogen, and the reactions will be similar to those in a typical landfill environment. But many reactions will be different because of salt corrosion and the oxygen-deprived environment and because different bacteria will be involved.

The rates of gas generation are uncertain. Right now, our estimates are based on small-scale lab studies. Experiments using actual wastes will enable us to make better judgments. In two years, we will have enough data to make preliminary performance assessment calculations. The experiments will run longer to increase our level of confidence in the data.

LN: Can chemicals be used to minimize potential gas buildup problems?

WW: The study of getters [materials that combine with gases to change them to solids] or inhibitors [materials preventing gas formation] is part of the gas-generation issue. Experiments at WIPP will address the use of these materials. We're doing lab research to determine which materials to test in the alcove-scale tests.

LN: Why didn't the gas issue come up earlier?

WW: It did. In the late 1970s, we conducted surface-based field studies on the permeability of the salt formations. These tests indicated that the permeabilities were high enough that gases generated from the wastes would simply diffuse away. The first really convincing evidence that gas generation could be a problem came in 1987 when we were studying brine seepage. We supplied the data to the National Academy of Sciences [NAS] panel, and it was brought to public attention in a February 1988 NAS report.

We realized as we acquired more data that the permeabilities we were measuring were less than

we had projected earlier. This meant that gas would not escape into the formation rapidly enough to avoid pressure buildup. To improve our confidence in the permeability data, we have expanded our measurements of permeabilities at the suggestion of NAS at underground sites, including the area where the actual waste storage rooms are situated.

LN: What is Sandia doing about the brine issue? What about reports that WIPP is leaking?

WW: First, leakage isn't a very good description of what is happening. There is no flow of brine into or out of the repository from adjacent aquifers. In fact, the movement of brine is very limited. The inflow, or seeping, into the waste rooms is from brine that occurs naturally in the salt and is squeezed into the rooms as a result of the large pore-pressure changes and microfracturing caused by excavation. The gas pressure buildup in sealed rooms will reduce even this slow inflow of brine into a room. We are conducting several experiments to get better data on brine seepage and gas generation.

LN: Suppose, sometime in the future, a driller punched a hole from the surface into one of the WIPP caverns. What would happen, and what is being done to prevent this from happening?

WW: Human intrusion into the repository by drilling could release some radioactivity directly to the surface and into the overlying aquifer. The performance assessment group will calculate the amount of radioactivity released in these various scenarios and compare these results with the release limits in the EPA standard. That standard allows the probability of intrusion to be reduced over the next 10,000 years by erecting long-lasting monuments or markers to warn of the repository's existence. But such markers cannot totally eliminate the probability of intrusion.

LN: Does this mean brine combined with waste, or slurry, is still an issue?

WW: We believe we can now dismiss the concern that a slurry of brine and waste could form and exacerbate releases in the case of human intrusion. But brine is also important in the gas-generation issue. Anoxic corrosion [without oxy-

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gen] of metal can form hydrogen in the presence of brine. In some experiments, we are adding brine to simulated wastes to understand this gas-generation mechanism and to study the concentration of radionuclides in brine. There is a large uncertainty about the expected concentrations because the chemical characteristics of the actual waste vary so much.

LN: Aren't the cracks that are forming in the salt rooms dangerous to WIPP safety?

WW: Cracks have formed above, below, and to the sides of some of the six-year-old rooms. They are a natural result of the creep of salt into the mined rooms. Waste rooms mined a year and a half ago haven't yet formed large cracks, but they will later. Our studies of some of the first rooms mined at WIPP show the disturbed zone began to form immediately, but cracks became pronounced enough to be a personnel safety issue about three or four years after mining. The largest cracks form parallel to the ceiling about six feet above the rooms. Gravity could cause a slab of salt to fall from the ceiling. In the last year, the cracks have been opening at a faster rate than expected.

For safety reasons, Westinghouse mine engineers have used 10-foot rock bolts in the ceilings of the waste rooms. These are like exaggerated toggle



SAMPLE TAKING: Sharon Finley (6344) uses a capillary tube to capture a brine sample from a freshly mined surface. Such samples and analyses have helped scientists understand the limited fluid movement that occurs within the Salado Formation.

bolts [spring-loaded household fasteners] to keep the slabs from falling. Future waste rooms won't be bolted, because cracks won't form rapidly enough to present a safety concern during actual operations. The rooms will be mined and filled too quickly. As the room comes to closure, back pressure will cause the cracks to heal as the salt recrystallizes.

LN: Where do we go from here?

WW: We have to complete a defensible performance assessment in the next three years. This means we will have to combine the extensive data base derived from past WIPP experiments with new information that will be obtained over the next three years. The planned experiments using actual wastes underground are very important to the final scientific appraisal of WIPP.

LN: Does this mean Sandia's role at WIPP is diminishing?

WW: No, just that there are more players. We have long since passed the stage when WIPP was more or less a Sandia investigation. In the case of the proposed radioactive waste experiments to be done during the next five years, the instrumentation, data recording, and analysis will be done by Sandia. The hardware engineering and development — of the bins, the alcoves and the seals — and the waste handling will be done by Westinghouse. [Bin tests will be housed in metal containers measuring 4 by 4 by 3 feet, allowing no interaction with other tests or the environment. Alcove experiments will be conducted in small rooms carved into the salt and sealed off with inflatable or rigid seals to permit study of waste-environment interaction.]

You can't operate a facility like this without a Westinghouse. The true picture is that all participants have a crucial role to play in bringing WIPP to the point that it is an operating repository and contributing to the solution of DOE's waste management problems.

LN: Will we be cutting back or adding people?

WW: We added two additional divisions this year and about ten more staff positions so that we can complete critical studies over the next three to five years. Our field test crew [9325] is also planning to add people to staff the increased experimental activity at WIPP.

LN: When will Sandia complete its major responsibilities at WIPP?

WW: The crystal ball gets fuzzy when you try to look too far into the future, but I can say this: Experiments now being emplaced, for which Sandia has a major responsibility, have a design life of five years. The concurrent process of comprehensively evaluating the performance of WIPP with the EPA will take three to five years. We can expect to be heavily involved for that length of time. And given the history of waste management projects of this magnitude, I would be hesitant to forecast there will be no remaining work for Sandia beyond that time.

Wendell: WIPP's 'Main Media Man'

"In view of the Malta Summit and of possible dramatic weapon-stockpile reductions, there is still the enormous problem of what do we do with all the radioactive wastes that have piled up from forty years in the defense program?" That question was posed by Peter Jennings to millions of viewers on a recent edition of the ABC Evening News.

The newsclip that followed focused on the Waste Isolation Pilot Plant (WIPP), near Carlsbad, N.M. WIPP is the government's best hope for a storage repository, said reporter Barry Serafin, but a project beset with difficulties.

Wendell Weart, wearing his distinctive bolo tie, appears on the television screen. Wendell is showing Serafin around WIPP, patiently explaining the concept of a geologic repository to the network reporter.

Even the thawing of the cold war, in its own way, puts more pressure on Wendell. He has garnered about five seconds of air time for his day-long effort, including four hours of recorded conversation during an underground tour. "If we can't do it at WIPP, I seriously doubt it can be done anywhere," he tells Serafin and a national TV audience. Detractors of the project net more time on the three-minute segment, but Wendell is used to that. "If I had to choose one thing I said out of the entire day, that would be a good choice," he says.

Geophysicist Turns Media Specialist

Dealing with network crews and journalists from a variety of other programs in the US and abroad — including recently "Nova" and "MacNeil-Lehrer Report" — has become a significant part of Wendell's job. His name hasn't yet become a household word, but he is often relied upon by the Department of Energy and others associated with WIPP to objectively explain the project.

How did Wendell Weart, geophysicist, come to be Wendell Weart, WIPP spokesman? (ABC didn't mention that Wendell was a Sandian.) The answer: 14 years of dedication to the same project.

Wendell earned a BA degree in geology and mathematics at Cornell College and a PhD in geophysics at the University of Wisconsin. He joined Sandia in 1959 and was

named supervisor of the Underground Physics Division in 1969. Wendell shifted from investigations of ground motion, seismic effects, and containment issues relating to underground detonations in 1975, when he was named manager of Nuclear Waste Technology Dept. 6340.

Going on 15 years later — and a lot of round trips to Carlsbad and Washington, D.C. — that's the job he still holds.

Wendell estimates he traveled to Carlsbad every two to three weeks in the first years of his WIPP assignment. In 1983, when the DOE project office was located there, he began making weekly trips — a practice he still follows.

National Interest Escalates

As his travel schedule has escalated, so has national interest in WIPP. Wendell estimates he now spends about 20 percent of his time showing news reporters or government VIPs around WIPP.

How is the news coverage? "The news media are not uniform in their coverage," he says. "Some reporters may emphasize problem areas to the detriment of scientific fact, but others clearly make an effort to be as fair and unbiased as possible." It is very difficult to cover the technical issues involved in studying WIPP, given the time and space constraints reporters often face, Wendell notes.

During his tenure at WIPP, Wendell has seen "burning issues" come and go as the application of patient scientific research has provided more and more answers about the nature of the vast Salado Formation, in which the wastes will be stored, and the geologic processes that could affect it.

What's the most memorable event in the evolution of WIPP from 16 square miles of desert to a \$750 million facility ready to conduct experiments with actual radioactive wastes? To date, it's the existence of WIPP itself that's most satisfying, Wendell says, "to have reached a stage where the information we have gained can be applied to assessing the performance and site suitability. It's not any one single event, but more a case of seeing our plans actually come into being.

"We made a plan and we carried it out."

Shaping World Opinion on Nuclear Waste Disposal

WIPP Experiments Study Waste Containers, Sealing Methods, and Salt Behavior

The geology of 225 million years blurs past as the elevator rushes downward on its five-minute run to the salt repository 2150 feet below ground. Sunlight from the surface is quickly lost as the shaft swallows the elevator cage enroute to its destination below.

Scientific experimentation takes place amid a bustling community of activity. Connected by tunnels, or drifts — some highway-wide — an excavated maze is alive with workers. In pools of light, they attend to the countless details needed to ready the Waste Isolation Pilot Plant (WIPP) for operation.

It is warm in the repository, where natural heat from the earth keeps the temperature at 82°F. Forty thousand cubic feet of fresh air is circulated

What is learned here is shaping world opinion on future disposal of nuclear waste.

through the main drifts every minute. This helps make the work more tolerable, but out of the main air flow, workers quickly notice the heat. Air locks — double sets of mechanical doors — help channel the air through the mine. These present a constant maintenance challenge for the miners because the salt walls, ceilings, and floors creep around the door frames.

At the south end of the underground complex, a panel of seven recently mined rooms stands ready for Sandia bin and room-scale experiments (see map). These could begin with the delivery of

transuranic wastes by summer of 1990 (see "Proving Its Safety . . .").

Beginning with laboratory tests and small field tests in salt formations at Carlsbad-area potash mines in the 1970s, Sandia's effort has now pushed forward to the brink of large-scale testing in WIPP itself.

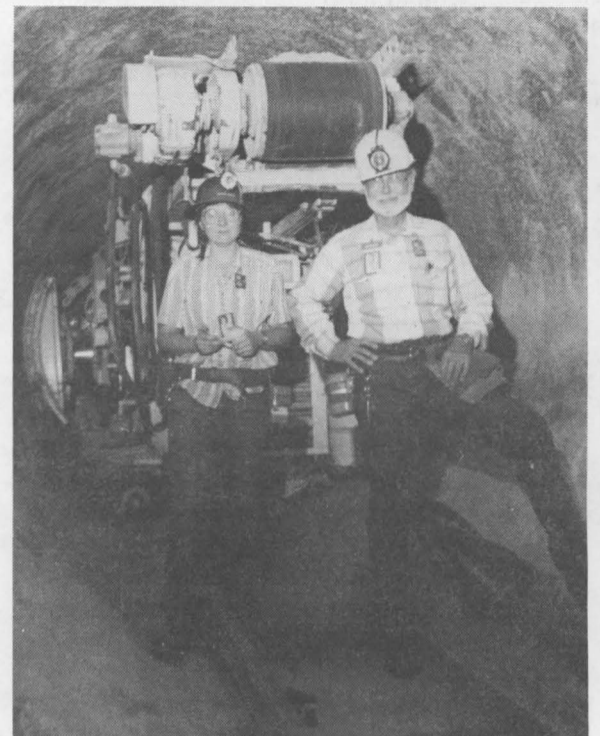
At the north end of the underground complex lies a cluster of experiment rooms used by Sandia to study various aspects of waste isolation in crystalline salt. Wendell Weart (6340) and other researchers at the experiment-room complex recently gave the LAB NEWS a tour of some of the key experiments. These focus on:

- (1) how the waste containers will interact with the repository environment,
- (2) ways to seal shafts and drifts, and
- (3) structural/thermal response of the salt.

What is learned here is helping to shape full-scale experiments that will be conducted during the next five years. It is also shaping world opinion on future disposal of nuclear waste.

Waste Container Tests

Materials Interactions — The Materials Interface Interactions Test (MIIT) is a high-level nuclear waste study to understand how various canister metals and vitrified (glass) wastes would react in the hot, corrosive environment of a salt storage room. Although the US has no plans to store high-level wastes in salt, observers from seven participant countries are interested in the data being derived, explains Martin Molecke (6345), principal investigator for the test. (WIPP



BRINE INFLOW TEST — Sharon Finley (6344) and Jim Nowak (6346) survey the beginning of what became the 350-foot-long circular Room Q in August. The circular design is expected to reduce crack formation in the surrounding salt so that there is a better chance of measuring brine approaching the room.

will be a repository for transuranic wastes, not high-level wastes.)

Participating countries provided a variety of non-radioactive waste forms for the five-year experiment, with sampling at six months, one year, two years, and five years. Test results from the first three samplings were reviewed at an international workshop in France last year.

MIIT is now in a maintenance mode, explains Tom Burford (now 9324), opening the door to an

Forty thousand cubic feet of fresh air is circulated through the main drifts every minute.

uncomfortably hot, 105°F Room J. Glasses and metals will be sampled and analyzed again at the five-year mark. In the interim, they remain in heated, brine-filled boreholes in the salt floor of the room.

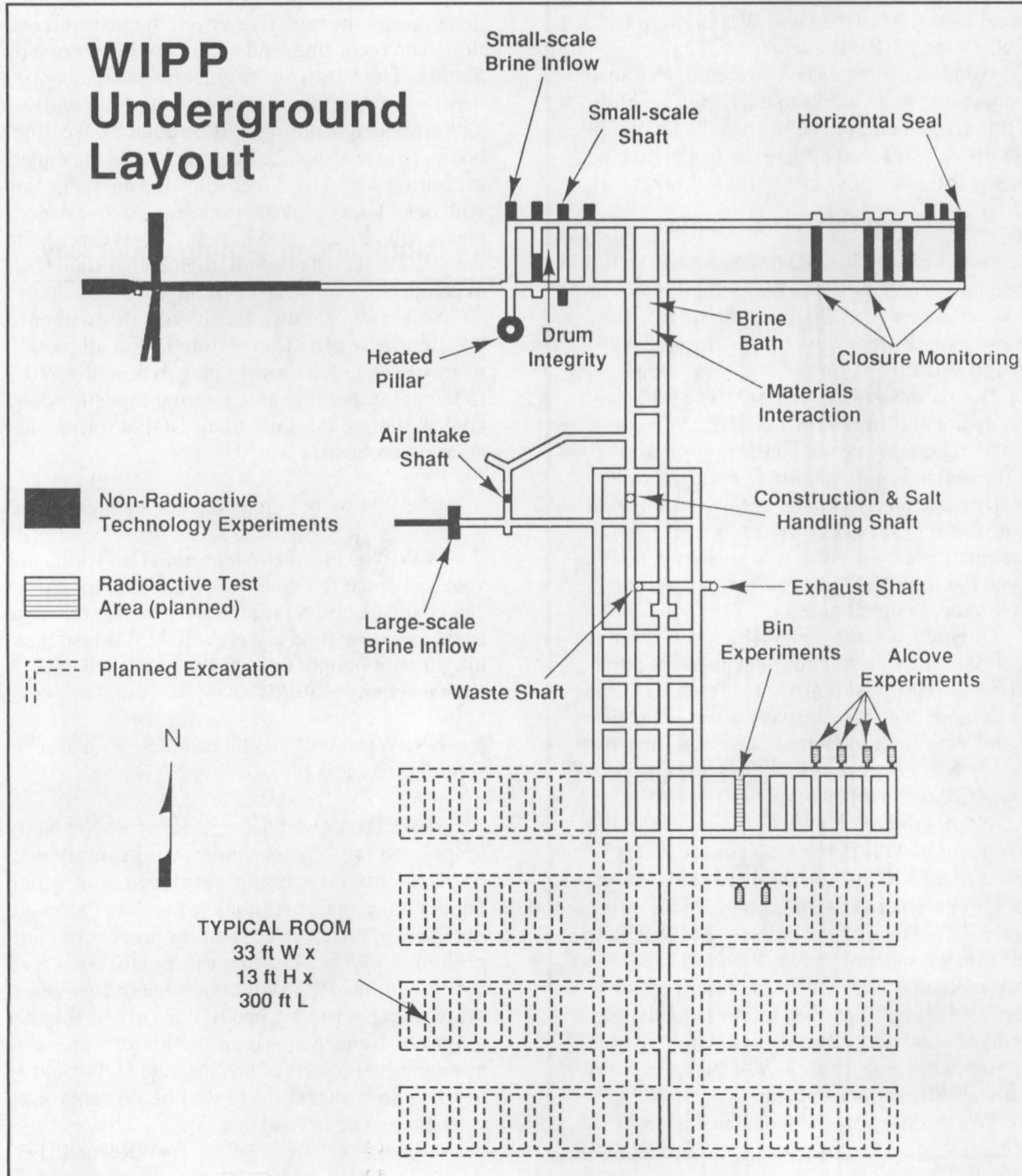
Brine Bath — Also in Room J is a drum test for less radioactive, contact-handled transuranic wastes that will be stored at the repository. In this test, drums — some protected with bentonite backfill — are stacked in a brine-filled, heated bath. (Bentonite is a clay that absorbs water that may contain isotopes of interest.) Regular samples are taken in order to analyze chemical reactions between brine and barrels.

These packaging tests — like others being conducted underground — are actually overtests, explains Tom. By increasing the temperature above that actually expected underground, the reaction processes are accelerated, allowing better modeling of reaction rates in a shorter time.

Drum Integrity — In Room T, still more package materials tests are under way. To predict the integrity and retrievability of contact-handled waste drums during the five-year test period, 240 drums were stacked against a rigid steel-and-concrete-reinforced wall. The room was backfilled with crushed salt and a salt-bentonite clay mixture, then heavily instrumented with gauges to measure pressure on the drums during closure of the room.

In the walls, or ribs, of Room T, remote-hand-

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dled waste canisters, electrically heated to about twice the expected thermal output of actual waste, were placed, backfilled, and instrumented for closure rates, temperature, and pressure. Stainless steel canisters with a thick steel overpack and non-corrosive titanium canisters were evaluated in this test, which began in September 1986 and was completed last summer.

Closure Monitoring — Electrically heated waste package canisters were also emplaced in Rooms A1 and B to simulate defense high-level wastes in 1985. While the containers were removed in 1988, Wendell Weart explains, these rooms continue to provide valuable data on closure. Since they were some of the first rooms mined in the repository, they are being watched to understand just how room deformation occurs. It is in these still-instrumented rooms, where closures of 25 to 30 inches have been recorded, that cracks have begun to form in the surrounding salt (see "Proving Its Safety . . .").

Since it is identical in dimensions to Room B, but was not subjected to heat from the waste packages, Room D is being closely watched by Sandia scientists as a basis for comparison.

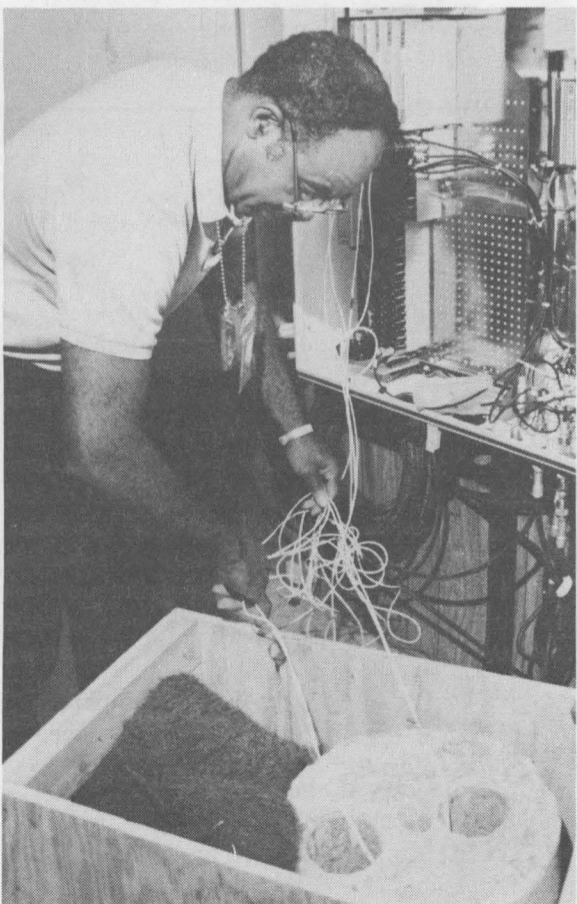
Seals and Plugs

Once the entire repository is full of radioactive waste, shafts and drifts in the repository will be sealed, usually with crushed salt, to guarantee long-term isolation of the wastes. The salt will eventually reconsolidate to its original density and strength.

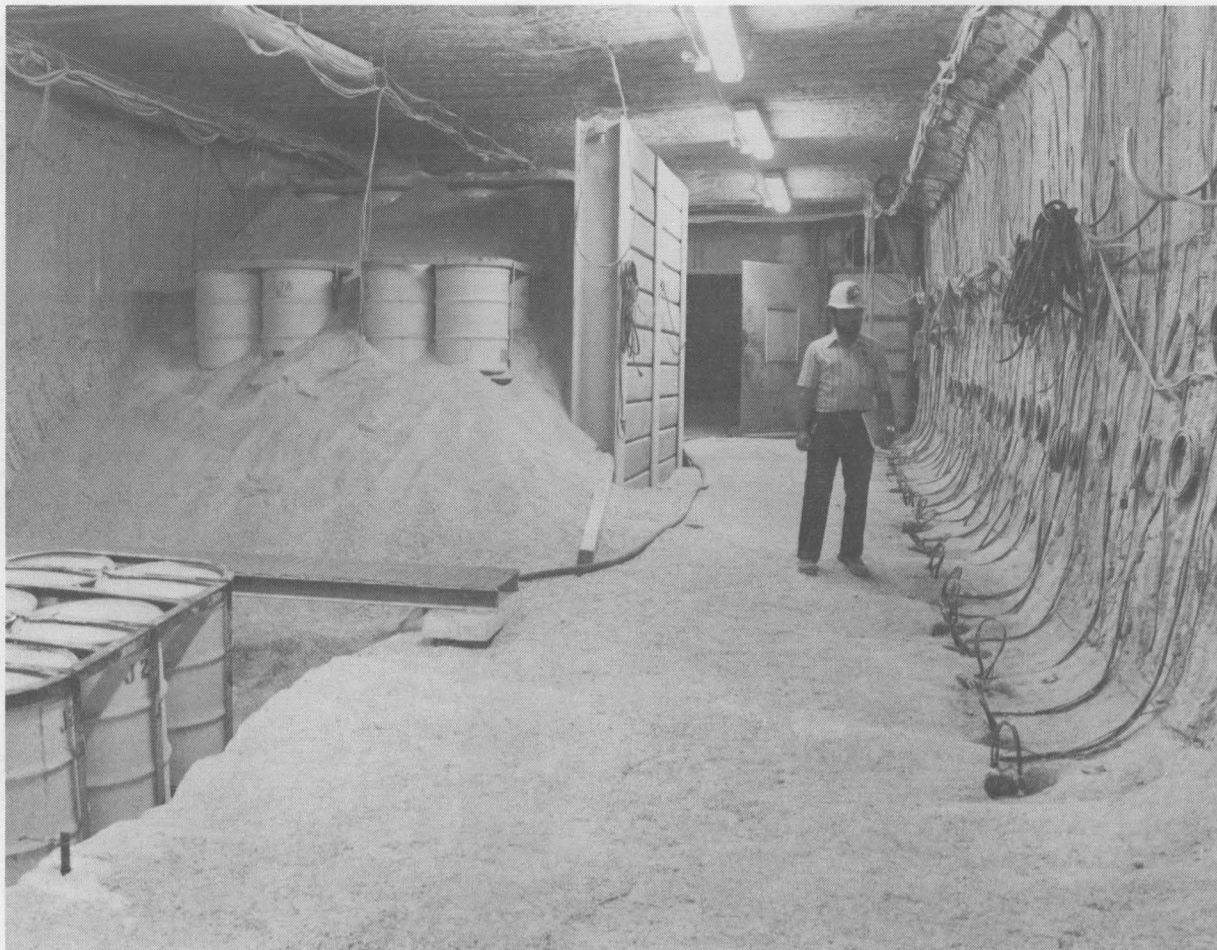
In some cases, water-absorbing bentonite may be added to the salt. This will help handle brine and other potential liquid problems, says Cliff Howard of RE/SPEC Inc., a Sandia contractor. Laboratory and in-place experiments indicate this is a workable solution.

Salt for making the seals is available from nearby surface piles. An adobe-block-making machine located underground forms the crushed salt into blocks.

Small-Scale Shaft — In Room L-2, three 35-foot-deep, 38-inch diameter shafts accommodate a



ULTRASONIC TEST GEAR is checked by Jim Johnson (9325) before its installation in the WIPP air-intake shaft. The pressure gauges, transmitters, and receivers were developed by Steve Breeze, Cliff Kinabrew, and Terry Steinfort (all 9316). Dave Holcomb (6232) designed the experiment to measure fracturing and change in fluid content near the shaft wall.



HOT SPOT of the underground experimental areas, Room J houses experiments with contact-handled waste containers. Special safety provisions help workers cope with heat and humidity in this work environment. Here, Marty Molecke (6345) is checking on a materials experiment contained in this room. (Westinghouse photo)

small-scale experiment that contains seals and instruments to measure pressures, temperature, and other conditions under which the seals must function. Observers can look into the lighted, sealed shafts through thick, clear plastic covers.

The salt blocks used in the experiment have been formed to 80 percent of the density of intact-formation salt, explains Cliff. "Part of the effort here is to show we can place seals in a round shaft," adds Jim Nowak (6346). Workers set the blocks in place and carefully fill cracks with a powdered bentonite.

Horizontal Seal — Small horizontal seals are being tested in Room D to determine whether they can be used to seal-in tunnels and waste rooms. Rows of salt blocks sandwich a salt and bentonite mixture, which acts as a barrier to fluid flow. In theory, brine or other liquids would swell the sandwiched mix between the blocks to reduce permeability. Brine is being deliberately introduced to test this idea in some experiments.

Other barrier experiments range from combinations of salt and bentonite, salt and concrete, to pure bentonite or salt barriers.

Formation Response Testing

Sandia scientists have calculated the expected results of almost all major tests in the repository. These calculations were used to set instrument ranges, to offer an opportunity for peer review of the experimental concepts, and eventually to serve as a test of early predictive capabilities.

Accuracy in calculating how the salt beds will react to mining and the heat from radioactive wastes is critical to predicting overall success of the project — over a 10,000-year period.

In the study of salt creep, for example, scientists came to the *in situ* experimental phase with a range of creep rates, Wendell explains. Underground data have proven the rate is about three times the expected response, requiring a refinement of earlier models. "Once you recognize that the creep rate is faster, most of the descriptive behavior of the salt goes along with what we expected," he says.

Because thermal and structural responses of the Salado Formation are related to the gas-generation issue (see "Proving Its Safety . . ."), a number of experiments are continuing or getting under way.

Two experiments incorporating creep and brine inflow are under way in Rooms Q and L-4, respectively. Their sizes are markedly different.

Large-Scale Brine Inflow — Room Q, completed in August, is a 10-foot-diameter, 350-foot-long cylinder, bored into the same level where the waste rooms ultimately will be situated. The cylindrical shape is important because it's believed that forces on a round room reduce the cracking that

Because thermal and structural responses are related to the gas-generation issue, a number of experiments are continuing or getting under way.

develops in the disturbed zone, says Jim Nowak. Reduced cracking will permit more accurate assessment of the amount of brine approaching Room Q at different points.

"The pressure of brine in the pores of the salt varies at distances from the mined wall," Jim says. "Permeability and pore pressure measurements can help us understand the response of the rock to excavation and the conditions under which the brine begins to move."

Small-Scale Brine Inflow — A much smaller, but related, experiment in Room L-4 calls for vacuum pumping of the 36-inch-diameter bore, which is instrumented to measure creep, humidity, and temperature. "We are trying to relate brine inflow to creep," says Sharon Finley (6344). "By pumping, this experiment will ensure that we see the brine. We may not see it in the larger-diameter bore." As with Room Q, she explains, instruments will measure characteristics of the disturbed zone beyond the bore to determine brine dynamics in this area.

Heated Pillar — The highly instrumented round room, Room H, is one of the better-known structural experiments. Here, miners cut out a round room, leaving a 36-foot-diameter core of salt where measuring instruments have been emplaced. Sheathed with a 6-inch-thick blanket of insulation, the core was measured and is now being heated to 70°C to check for deformation.

The closure of the room is also being checked. So far, vertical closure is about 11 inches; horizontal closure, about 10 inches.

Where Are We Going?**The '90s: Act Three for Sandia 'WIPP Players'**

A number of 1989 actions by institutions with oversight responsibilities have set the stage for WIPP's entry into the 1990s.

Reports and statements by the National Academy of Sciences (NAS), Environmental Protection Agency (EPA), and the Blue Ribbon WIPP Panel ap-

Act One involved site characterization work, to confirm the best location for the mine.

pointed by Secretary of Energy James Watkins have all put the spotlight on underground experiments that will use actual radioactive wastes at the repository. (Early tests used simulated wastes.)

For Sandia, Act Three at the giant repository is beckoning. Act One involved site characterization work, which included drilling more than 100 test wells and completing detailed geophysical surveys and other studies to confirm the best location for the mine. Act Two covered the first series of underground experiments, involving the structural deformations of the salt, the interactions of simulated wastes with the environment, and other issues (see "WIPP Experiments . . .").

Act Three Will Be Critical

With several important political and scientific hurdles yet to be cleared, Act Three will be critical to providing the data needed to answer the overrid-

"WIPP may well prove to be one of the most difficult assignments Sandia has ever undertaken . . ."

ing question: "Is WIPP a reliable solution for America's disposal of four decades of weapon program transuranic wastes?"

A consensus has developed among several institutions that the Labs should move ahead as quickly as possible with underground experiments using actual wastes, explains Wendell Weart, man-



SALT BLOCKS, made underground with a special machine, are the key element in one proposed method of sealing shafts and horizontal bores after wastes are in place. Here, a Westinghouse worker applies a salt-dust paste to a block before setting it in place in a horizontal test drift. (Westinghouse photo)

ager of Nuclear Waste Technology Dept.(6340). These experiments will shed more light on the processes that are likely to occur within and around the salt storage rooms once wastes are in place.

"WIPP may well prove to be one of the most difficult assignments Sandia has ever undertaken," says Dan Hartley (VP of Energy Programs 6000).

"It is scientifically challenging, politically complicated, and confusing to society — yet vitally important.

"Our contribution to the WIPP project has been pivotal. We provide the scientific underpinning, the corporate memory, and the interface to
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WIPP Glossary

(Many of these definitions apply specifically to WIPP operations. Some of the concepts mentioned are not yet incorporated into actual experiments.)

Alcove — small room mined from the salt and filled with radioactive wastes to test the interaction of the wastes and the repository environment. Alcoves are designed to be sealed on the side open to the mine.

Aquifer — fractured or porous subsurface rock or sediments that serve as natural water reservoirs.

Backfill — crushed salt or a salt-bentonite mixture used as fill around drums of waste stored underground. The backfill will absorb the small amounts of brine that may seep into the waste rooms.

Bentonite — a clay used as a filler that expands to many times its dry volume when wet.

Bins — metal containers, measuring 4 by 4 by 3 feet, used for tests in which wastes are isolated from the environment and sampled through specially constructed ports.

Contact-Handled Waste — a category of

packaged transuranic (TRU) wastes (see definition below) with gamma-radiation levels low enough that they can be handled directly, without shielding. (A relatively small volume of TRU wastes — which must be remotely handled — emit significant gamma radiation and must be more heavily shielded for safe handling and storage. These are called remotely handled wastes.)

Disturbed Zone — the region surrounding a borehole or excavation where the natural physical properties of the rock are affected by mining activity.

Drift — a horizontal mine passageway. At WIPP, these run parallel to the rock strata.

Formation — a rock unit with geologic properties that differ from neighboring formations. For example, the Salado Formation is characterized by large deposits of salt.

High-Level Waste — highly radioactive waste material that results from reprocessing spent nuclear fuel and contains transuranic and fission products in concentrations requiring permanent isolation. (No high-level waste storage is planned at WIPP.)

Hydrology — the study of surface and subsurface water.

Mixed Wastes — wastes containing both a chemically toxic component and a radioactive component.

Permeability — a measure of the ability of a rock or other earth material to transmit fluids such as water.

Shaft — a vertical mine opening made for gaining access to underground workings or for ventilating these workings.

Transuranic Waste — waste contaminated with radioactive elements heavier than uranium — thus the prefix trans (beyond). Also called TRU wastes, the radionuclides contaminating them must have a half-life of more than 20 years and exceed certain concentration levels. They typically include chemical process residues, discarded machinery and tools, casting crucibles and molds, glass, gas filters, metal, rubber, plastics, firebrick, paper, rags, gloves, and clothing.

Vitrified Waste — a waste encapsulated in glass. Developed primarily for high-level radioactive wastes, the glassification process is believed to make the waste more stable for storage.

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technical investigations that are necessary to satisfy regulatory concerns. Wendell and his team have provided stewardship and commitment 'above and beyond the call.' "

Among the relevant 1989 activities:

- In July, a National Academy of Sciences expert panel urged room-scale experiments "without delay" to resolve questions of gas generation in wastes. However, the panel suggested that a planned operations demonstration project — to show wastes can be handled safely — be put on hold until scientific questions can be answered.

- The EPA became much more involved in WIPP. It is now studying the DOE's request for a variance on certain mixed waste requirements. The EPA also has been ordered by the US Court of Appeals for the First Circuit (Boston) to rewrite regulations on geologic repositories. As a part of this process, EPA officials are taking a close look at WIPP to determine what appropriate standards should include.

- In October, Secretary of Energy Watkins set an adjustable timetable for the opening of the repository. It suggests the earliest opening date for

Act Two covered the first series of underground experiments, involving the structural deformations of the salt, the interactions of simulated wastes with the environment, and other issues.

the receipt of waste for testing purposes would be July 1990. Secretary Watkins again made it clear that WIPP will not open for permanent waste disposal until it meets all environmental standards and until it receives his personal approval.

- The life of a five-member Blue Ribbon Panel, appointed by Secretary Watkins to advise him on WIPP, was extended after its members tendered their initial reports. (Each panel member reported individually to Watkins.) There was agreement among most panel members that in-place experiments using actual waste should begin as soon as possible.

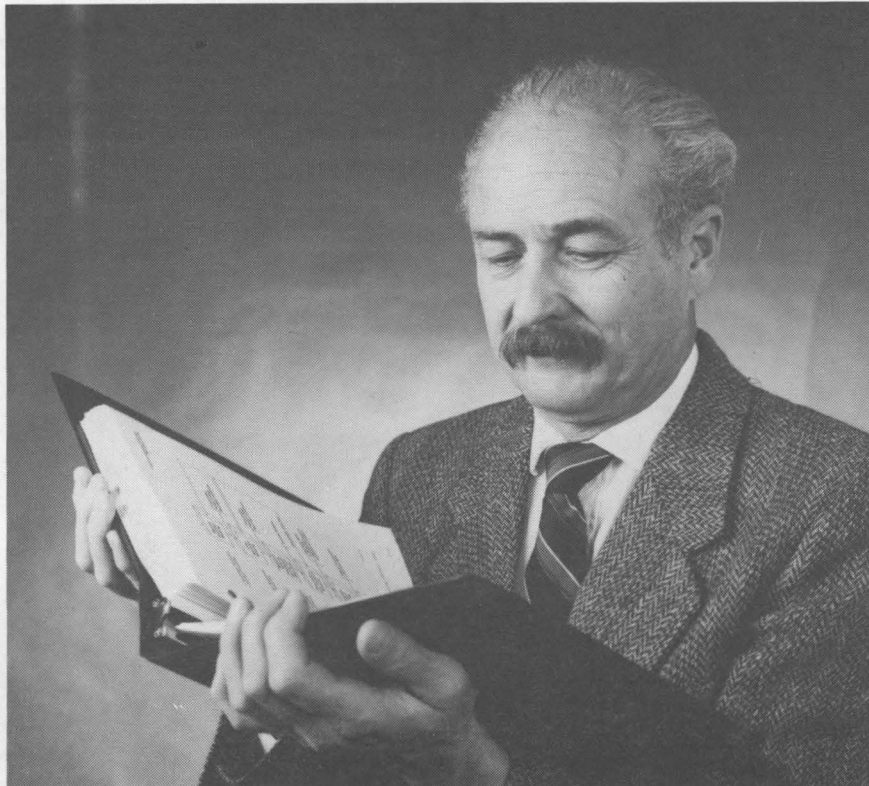
Three More Oversight Groups

Other agencies or groups with oversight responsibilities at WIPP include the DOE "Ahearne Committee," appointed to study the safety of the nuclear weapon production complex, the New Mexico Environmental Evaluation Group, and the New Mexico Environmental Improvement Division.

One of these — John Ahearne's Advisory Committee on Nuclear Facility Safety — just last week suggested another hurdle for WIPP. (Ahearne is a former DOE and NRC official, now in private industry.) The committee called for a new analysis of whether or not WIPP is likely to be able to meet the EPA's regulations before any waste is brought to the site. In a letter to Secretary Watkins, Ahearne said that some members of his committee don't believe WIPP can meet the EPA standards as now written.

It appears an experimental phase using actual radioactive wastes in room-scale (alcove) and bin-sized tests could begin by mid-1990. However, this will require a widening of the agreement that such testing should be conducted and acceptance of a plan to begin an annual update of the performance assessment process. (See "Performance Assessment: Key to WIPP Success.") It will also require that a series of decisions from Congress, EPA, and other official bodies be made before this can happen.

A draft plan outlining the proposed new experiments, titled "Final Plan for the Waste Isolation Pilot Plant Test Phase: Performance Assessment," was released this month. •



RIP ANDERSON (6342 supervisor) is charged with determining whether WIPP can meet EPA standards.

The Bottom Line

Performance Assessment Key to WIPP Success

Sandia's main product at WIPP may be real-time scientific data, but performance assessment (PA) is the bottom line. PA is the balance sheet that helps investigators and regulators gauge whether the repository can successfully meet EPA performance standards over a 10,000-year period.

To Rip Anderson (6342 supervisor), performance assessment is the creation and application

The EPA regulations are very demanding, particularly in terms of the human-intrusion scenarios.

of mathematical models to project known data into a forecast of WIPP's future. "Every experiment you see at WIPP is providing information we need," he says.

From these experiments, Rip and his staff compile known processes into various inferred hypothetical scenarios and construct mathematical models that simulate these processes. Since it is their job to make long-range predictions, Rip and his group work closely with Sandia investigators who are developing a WIPP "test phase" plan that will be carried out over the next three to five years. (This plan includes experiments that will be conducted at WIPP with actual transuranic wastes.)

Rip also works with Sandians on site, where experiments must meet demanding quality assurance specifications. His typical week includes a one-day trip to Carlsbad.

Dozen Done: More to Come

Charged with mapping scenarios of interest, Rip and his staff have sorted through about a dozen events or processes that could affect WIPP in the future. More remain to be considered. Those of interest will be evaluated carefully before final calculations are made.

Within the PA Division:

- Mel Marietta is supervising all PA calculations.

- Sharla Bertram-Howery is interpreting EPA regulations, taking calculations from Mel, and putting the information into a format that will meet DOE approval.

- Rob Rechard is developing CAMCON, a complex computer project with more than 150,000 lines of code that links various programs, differing scales of models, and uncertainty analyses.
- Leo Gomez is coordinating the acquisition

and use of models and data to compute dose calculations. These are calculations of likely radiation exposure that would result if materials were to escape from the repository.

Together, these efforts help Sandia analysts determine how well they are answering site safety questions.

A document published in September outlined Sandia's approach to performance assessment. In less than five years, comprehensive calculations must be completed and the evaluations subjected to review, Rip explains. Sensitivity analyses — to show the potential stumbling blocks in terms of WIPP's ability to satisfy environmental requirements — must be performed at the same time.

Little Room for Slippage

Right now, data acquisition, model development, and performance assessment are being done concurrently. This leaves little room for slippage because of lost or unacceptable data or experiments that start late.

It will take several years to obtain and compile the remaining data to support the performance as-

"We have to address the problems on a regulatory front and a science front."

essment, Rip says. The first version of what will become an annual report on PA was produced by Rip's organization this month. However, the hefty volumes will be only part of an extensive, continuing process of calculations and revisions.

A number of new challenges — extending beyond the modeling and calculation effort — face the program. The EPA regulations are very demanding, particularly in terms of the human-intrusion scenarios, Rip explains. How well WIPP can meet these demands remains to be seen. "We have to address the problems on a regulatory front and a science front," he says.

What About Future Drillers?

One example of an area that needs clarification is the EPA's position on human-intrusion boreholes — where future drillers may penetrate the repository. The agency's regulation (40 CFR Part 191) tells evaluators they need not assume a drilling rate of "more than 30 boreholes per square kilometer" in a 10,000-year period.

"Even without the aid of markers, which
(Continued on Page Twelve)

(Continued from Page Eleven)

Performance Assessment at WIPP

could dramatically lower the number of drill penetrations, we only have to consider a couple of boreholes during the time of regulatory interest," says Rip.

The same regulation also requires assessors to assume the permeability of the borehole to be "typical of a borehole filled with soil or gravel . . . not the permeability of a carefully sealed borehole."

Improvements Can Be Expected

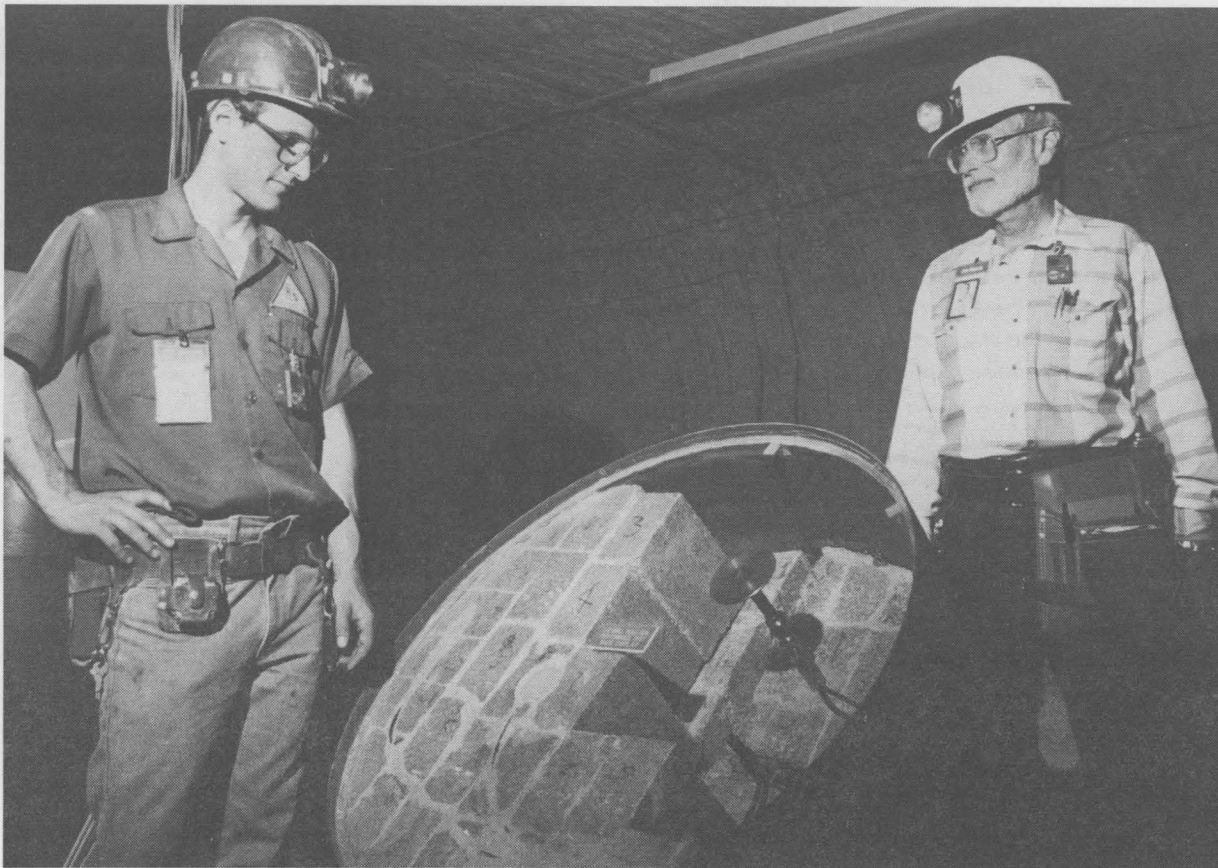
"They are giving us maximums, but not ranges to consider here," Rip says. "This aspect of the regulation seems inconsistent with guidance in other areas." He believes it unreasonable to con-

Data from these experiments will be used to build models and calculate the bottom line for WIPP reliability.

sider only current oil drilling and plugging practices, where a plug cannot be assumed to last for more than 75 to 150 years. "Joe Tillerson's division (6346) is developing plugging technology for the WIPP shafts that will last almost forever. We know that plugging methods can realistically be expected to improve, just as future drilling technologies will," he says.

"And we should be allowed to take advantage of the natural creep of salt, which will close the boreholes without relying on human technology."

In the human-intrusion scenarios, the plugs and the overall conditions in the waste rooms be-



SEAL MOCK-UP — Cliff Howard (RE/SPEC Inc.) and Jim Nowak (6346) discuss a model of one of several seals being studied in experiments at WIPP. As principal investigator for seals, Jim is studying a number of possible seal designs.

come critical elements of the assessment models. "By definition, human intrusion bypasses all the very good geological barriers," Rip explains. "The only improvements you can make are in the barrier strength of the rooms."

Studying Engineered Alternatives

Using this reasoning, the National Academy of Sciences recently asked for studies of engineered

alternatives — such as waste compaction or gas-venting — to improve waste room stability. Rip and his group will be working with Al Lappin and Disposal Room Systems Div. 6345 and an engineered-alternatives task force formed by DOE to meet this request. As in other work done by the PA group, data from these experiments will be used to build models and calculate the bottom line for WIPP reliability. ●

Continuous Collection

WIPP Has Sophisticated Data Collection System

No one knows better than employees of the Waste Isolation Instrumentation Div. 9325 that quality data is the main business of WIPP.

WIPP features a complex array of underground and shaft instrumentation that feeds data

from various locations to data-acquisition sheds throughout the mine. From there, the data go to Sandia's main data-gathering facility, a trailer known as B-49.

Originally developed by Tom Schultheis

(6343) and Ken Kimball (now 2331) for use in *in situ* coal gasification and oil shale research projects, B-49 is the cerebral center of Sandia's quest for quality data at WIPP. On a flow diagram, it's like the top ornament on a Christmas tree with branches extending 2150 feet down into the earth.

"This is where we control the acquisition of data and where we store it as raw and engineering data," explains Jim McIlmoyle (9325), project leader at the site. Data from more than 4000 active channels are stored on dual, 480-megabyte hard disks by a ModComp central processing unit and dumped five times a day to tape. The system is set up to record data every four hours, 24 hours a day, seven days a week for years.

Scientists in Albuquerque can now get raw data almost from the inception of an experiment by reaching B-49 via phone lines and code words. "The communication system is based on Sandia experience at the Nevada Test Site and elsewhere," Jim says. "As a result, we have a system where scientists don't have to wait for data."

Hand-in-hand with gathering data is work to ensure that instruments are providing *accurate* data. An on-site instrument calibration shop, with primary calibrations done in Albuquerque and secondary standards kept at the site, is a key part of the effort. A software program developed by John Loukota (now 7412) permits the complex conversion of raw engineering data, typically recorded as voltages, to engineering units by the ModComp computers in B-49.

If readings beyond set tolerances are discovered during routine scans, alarms are activated. "There are a lot of checks and balances," says Jim. ●

MECHANICAL FORCES are translated into electrical output by the borehole closure gauge developed at Sandia. RE/SPEC Inc.'s Dan Schiermeister, holding the gauge, uses Sandia's on-site calibration facility to calibrate and recondition instruments to ensure reliable test data.



Requires Tremendous Coordination/Communication**Sandia Part of Larger WIPP Team**

For workers at Sandia's WIPP office east of Carlsbad, the daily routine rarely is routine. But the frequent call to do the extraordinary is considered a plus among the benefits of working at WIPP.

"People respond well to the challenge of not doing the same thing every day," explains Jim McIlmoyle of Waste Management Instrumentation Div. 9325. "That's why they like it here."

With the construction phase of the \$750 million WIPP project nearing completion, the key challenge today for Sandia's early-rising WIPP contingent (they start work at 7 a.m.) is doing experiments right: getting them fielded and keeping them working. Hence, the special need for a smooth-running program for administration and services, one that can handle increasingly complex relationships with other organizations.

Learning to Adjust

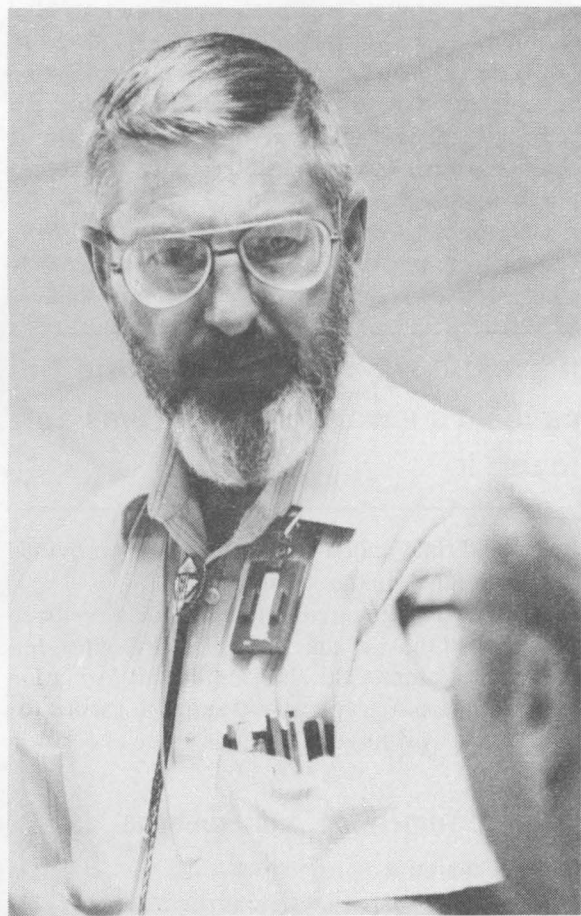
Wendell Weart (6340) provides perspective to current activities, explaining that, early on, Sandia was responsible for the lion's share of work in conceptual design, site exploration, environmental impact work, and experimental studies. "Then, as we got by that stage, the project grew and Westinghouse came aboard as operating contractor. We had to learn to adjust to being a member of a much larger team."

"We can't be as free-wheeling now," concurs Tom Schultheis, who supervises Sandia's WIPP

Tom has adopted a policy of "eating the elephant one bite at a time."

Site Operations Div. 6343. "We have detailed procedures for doing almost everything. It's more formalized. It has to be because there needs to be a tremendous amount of coordination and communication among Sandia, Westinghouse, and DOE."

"It's not an easy life," says Wendell, "but fortunately we have dedicated people here."



TEST PLAN — TASK LIST — REALITY. Tom Schultheis (6343) discusses the fielding of a new experiment underground. Tom coordinates the efforts of his staff, the field test staff in Div. 9325, Westinghouse, other contractors, and the DOE to arrive at best translation of a test plan into a reliable, data-generating experiment.

To cope with the necessary bureaucracy, Tom has adopted a policy of "eating the elephant one bite at a time." Tom recalls a morning in his WIPP office when he encountered 18 "distinct and different problems" in one two-hour period. "They all needed an answer, not tomorrow, but now," he says. Tom admits to no elegant solutions on this particular occasion, but only to staying cool.

Looking Like One Sandia

"Although we cross the division boundary lines with 9325 and within our own organization (6340), we try very hard to look like one Sandia down here," explains Tom. "That's important in helping us get along with our main task of figuring out how we will field an experiment."

"We start preparations for an experiment by obtaining real estate in the mine and designing a test room. Next, we see that the room is developed right and that utilities are available," says Tom.

Bob Rutter (9325) and his staff coordinate with Tom to ensure that the instrumentation is accurately calibrated, correctly installed, properly maintained, and operated to collect data in a timely manner. In short, Tom and Bob must take a test plan from the principal investigator and carry it through to a working, reliable data-collecting experiment. (See also "WIPP Has Sophisticated Data Collection System.")

In addition to coordinating duties with Division 9325 staff members, Tom and Wendell also must stay in concert with Westinghouse Corp., which has clear-cut operational control at WIPP,

and with DOE officials, who have oversight responsibilities. Because of cross-cutting and overlapping assignments — such as some Westinghouse employees being assigned to support Sandia — it becomes hard to know the players without a scorecard.

Five Sandians Are Permanent Residents

The Sandia Carlsbad staff, grouped into one of a collection of mobile office buildings at the north end of the WIPP site, includes five permanent

Because of cross-cutting and overlapping assignments, it becomes hard to know the players without a scorecard.

Carlsbad residents: John McKeever, Don Fulton (both 9325), Susan Pickering (6340), Tom Schultheis, and Faye Schultheis (6341), a Sandian assigned to the DOE operations office nearby. Fourteen contract employees plus 41 supporting Westinghouse employees also work with the Sandia staff.

About six other Sandia employees commute by air to Carlsbad on Monday and stay the work week, returning to Albuquerque for weekends. For this group, with family and friends still rooted in Albuquerque, the Motel Stevens on South Canal Street in Carlsbad is home away from home.

(Continued on Page Fourteen)

Among the Best in US**WIPP Has Award-Winning Safety Program**

Should you get an opportunity to visit WIPP's underground facilities, here's what you can expect first: a briefing from the Westinghouse safety department. A trip underground means wearing eye protection, donning a hard hat with mining lamp, and carrying a self-rescuer — a breathing apparatus that protects against carbon monoxide poisoning should a fire occur. (There's both a fire truck and an ambulance underground.)

You'll also pocket a numbered brass tag before you step on the hoist. It's part of the WIPP accounting system, to make sure no one's left below at the end of daily operations.

Frequent winners of mine rescue contests, Westinghouse's two safety teams — named "Silver" and "Blue" — are among the best in the US. For the third consecutive year, the New Mexico Mining Association — a 560-member organization of mining and mining-support companies — has honored WIPP for its superior safety record. The award, made to the Department of Energy, recognizes eight outstanding supporting groups in WIPP's success, including Westinghouse and Sandia.

This award grows out of one of more than a half dozen annual safety audits, explains Tom Schultheis (6343). "We are safety-audited like you can't believe," he says.

Earning the Right to Wear It

Tom has started a hard-hat sticker program to bolster interest in the safety effort. "A Year of Safe Work," the reflective stickers proclaim. "You've got to earn the right to wear one of the stickers," Tom explains.

Safety is an essential aspect of Sandia's work. For example, experiments now under way on salt permeability involve the use of high-pressure packers in small boreholes. Theo-

retically, these boreholes could behave "like shotguns" in the case of a packer failure, ejecting a hail of instruments into the mine. Other experiments in underground "hot rooms" have required special procedures, special medical examinations, stress tests, and the use of three-person teams to prevent worker exhaustion.

Safety is paramount in working in the 20-foot-diameter air intake shaft. Workers operate from a galloway — a two-level scaffold that can be moved up and down by a cable. During the next 18 months, the galloway is being used to place a large number of instruments in the shaft. The instruments will provide data on brine movement, salt closure rates, the disturbed zone, and other properties of the salt formation that are fed via cables to an instrument shed at the bottom of the shaft.

Tie Yourself In

"You can't drop tools, and you need protective eyeglasses and headgear to work in the galloway," says Don Fulton (9325). During the winter, a flow of cold air comes down the shaft, adding problems. "Safety belts are a must," says Don, who has been busy for months with the details of wiring the experiments and connecting gauges for the shaft experiments. "You must tie yourself to the galloway. An accident in a shaft can easily be fatal."

The final check on any experiment involves its safety. "We determine that mandatory operating procedures are written for each experiment so that it will be fielded and maintained as safely as possible," says Tom. Both Westinghouse and Sandia safety departments review these procedures.

"WIPP is safe," says Tom. "If you don't believe me, come down and check it out yourself."

QUALITY ASSURANCE is a byword at WIPP. Susan Pickering (left, 6340) and Janis Trone (Tech Reps, Inc.) are part of Sandia's effort to ensure that scientific conclusions are based on well-planned, well-executed, documented efforts.



(Continued from Page Thirteen)

WIPP Team

Sandia experimenters and others who make less extended trips to Carlsbad also use the motel, which provides special rates and accommodations to Sandia.

Possibly the most familiar WIPP "Sandian" to

many callers from Albuquerque is secretary-receptionist Nelcine Roland. However, she's actually a Westinghouse employee, assigned to assist Sandia.

Sandia Activities in Salty Subjects

Also a major asset for Sandia is *Salty Subjects*, a quarterly Westinghouse newsletter edited by Dee Armstrong. "Dee has been a big help in getting information about Sandia activities in the Westinghouse publication," explains Tom. "This helps us

maintain a good working relationship."

Adding the adjective "quality" to the data gathered by 9325 is an important service offered by Susan Pickering (6340): Quality Assurance. "Everybody has a different definition, but basically QA is showing that we are doing what we say we do," says Susan. "We plan what we do, do what we plan, and document what we did."

QA has become a byword at WIPP because of long-standing Sandia policy and because of what the project is, Susan explains. "This is a pilot plant and we are under the magnifying glass. We need a strong QA program to establish confidence in what we say and the conclusions we draw."

"Keeping all our people working in complementary directions is a full-time job," says Tom. But, something that will help the Sandia contingent at WIPP is coming soon: new office space. Now sited to the east of the existing quarters, a new mobile building has been awaiting water and power hookups while more urgent work in the mines took priority.

Walking through the still-empty structure, Tom points out to a visitor how he's going to use the space until a permanent R&D structure is built. The move has yet to happen, but the news is good, he says. The money to make the needed hook-ups has been allocated. It's just a matter of time. ●

Measuring the Creep

Sandia 'Wonder Machine' Used at WIPP

This is a story about early closure and the "wonder machine." Early closure at WIPP refers to the relatively fast rate of creep, or movement, that occurs in the Salado Formation immediately after salt has been excavated from the formation. In the case of WIPP, creep is good. It will help isolate radioactive wastes in underground rooms, as salt flows around the waste containers and seals them.

The wonder machine is the device a group of Sandians worked up to help get a fix on early closure. It's not called the wonder machine because it's a wonder it worked, but because it's a wonder Sandia was able to use it. "We came within a hair's breadth of not using it at all, because some folks at WIPP thought it was a pretty strange idea," explains one Sandia participant.

Sandia scientists began measuring creep in

laboratory experiments more than a decade ago and now are conducting a variety of tests underground. Scientists take their data, fit an equation to it, and then project it into the future.

From this, they try to understand when the rooms will be sealed to the point that wastes will be unrecoverable.

A Confounding Problem

But creep rates aren't uniform. Much of the structural response of the crystalline salt seemingly occurs shortly after mining or boring. This is the "early closure." How creep translates from small scales, where it has been carefully observed, to larger scales, where it has not, also confounds researchers.

A two-inch difference in the early deformation measurements can result in closure errors for room-sized spaces that are orders of magnitude apart, explains Darrell Munson (DMTS) of Repository Isolation Systems Div. 6346.

Given all this, Sandia scientists had long sought an opportunity to take a large-scale early measurement. The boring of the air-intake shaft —

It's called a wonder machine because it's a wonder Sandia was able to use it.

fourth and final major shaft at the site — provided that opportunity in the spring of 1988.

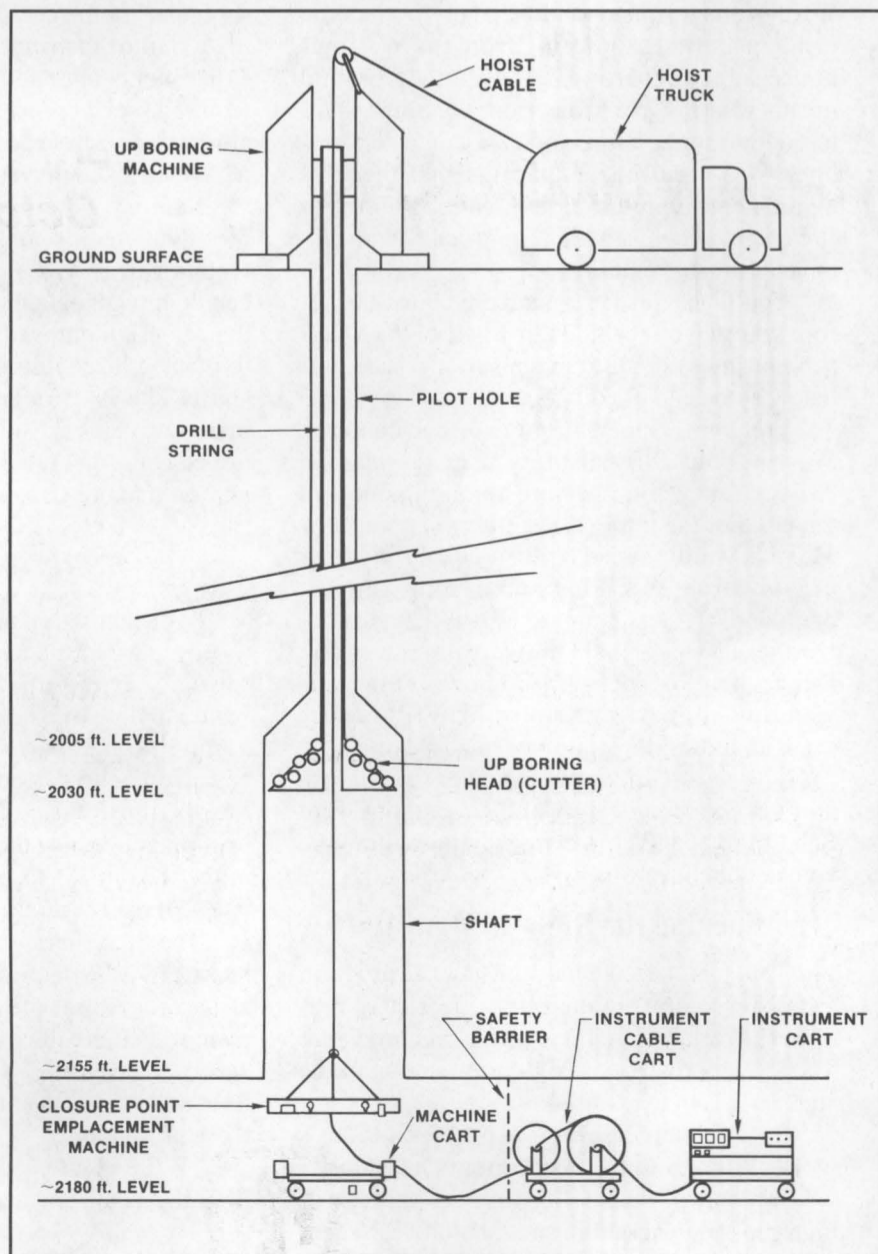
Rotary rigs located at the surface have been used to drill most of the shafts at WIPP. Thus, human exploration of the shaft in the salt formation within the shaft typically wasn't possible for months after drilling. A lot of closure can occur in that time.

Something, Not Someone

The air-intake project was different. It began with a 17-3/4-inch pilot hole drilled from the surface with a conventional rotary rig. Next, a raised boring system consisting of a 20-foot-diameter bit, was put together in the drift, 2180 feet below the ground, and a hydraulic boring rig was set up on the surface to pull the bit upward.

The rotating bit, pulled upward by the drill
(Continued on Next Page)

WONDERWORKS — Diagram shows how the "wonder machine" was raised under the upboring cutter head to aid measurement of early closure.



(Continued from Preceding Page)

string attached to the surface rig, carved the air-intake shaft. Sandia scientists realized that if someone, or something, could be put into the shaft below the ascending bit, measurements could be taken within hours of the drilling. The dangers of working under 90,000 pounds of steel ruled out the someone; a something was the only alternative.

From a concept sketched by Darrell Munson, Tom Schultheis (6343) and a crew of other Sandians and contractors at WIPP went to work building the wonder machine in Sandia's underground machine shop. The machine, essentially a 20-foot-

A Sandia cable truck was brought from the Nevada Test Site to lower a steel cable to the Wonder Machine.

long section of 12-inch plastic pipe with drills at each end, could be remotely telescoped to wedge snugly against opposing sides of the shaft. Holes were drilled at these two points, and precise measurements were made of the distance between the bit-ends for comparison with later measurements, when people could enter the shaft.

Construction of the machine took about a month. Another month was devoted to testing, practicing, and refining.

"The guys practiced with the machine until everyone knew what he was supposed to do," says Tom. A Sandia cable truck was then brought from the Nevada Test Site to lower a 3/8-inch steel cable through the 15-3/4-inch drill string and connect it to the wonder machine. The measuring device could then be drawn up the shaft.

A Big Saturday Night

After the bit had cut upward about 160 feet into the salt, the "wonder workers" gathered on a Saturday evening in May 1988 to do the experiment. More than two dozen people were involved, including a half dozen Sandians and workers from Frontier-Kemper, Westinghouse, RE/SPEC Inc., and IT Corp.

On the surface, Tom Schultheis and Larry Carrillo (9331) from the test site worked with Fron-

With lights flashing, the red, white, and blue machine slowly rose from its cart launching platform into the shaft.

tier-Kemper employees to thread the cable into the drill string.

Underground workers on both sides of the shaft strung lines across the 200 feet of "no-man's land" under the giant bit. Then the measuring machine was hooked up to the surface cable and placed beneath the shaft.

Finally, with lights flashing, the red, white, and blue machine slowly rose from its cart launching platform into the shaft. Television cameras on both ends of the wonder machine and on its cart permitted workers underground to monitor the direction and leveling of the unit. Cables attached to each end helped the underground crew maneuver the device while the surface cable truck crew controlled the ascent.

Working through the night, the crew was able to make measurements in the shaft at different elevations — and within 48 hours of the actual drilling. "The project required a lot of things to go right," said Darrell. And based on early analysis of the second closure measurements, he thinks the effort was worth it.

This second set of measurements, made on the spot by human hands, was completed only recently, more than 18 months after those produced by the wonder workers and their machine. ●

Mayor Estimates 95% Support

Carlsbad Supportive of WIPP Project

Coming into Carlsbad by air, you can see the meandering slate-colored Pecos River, geometrically arranged fields and ditches, and a cluster of a town. Beyond the community of 26,000 is the gray desert of southeast New Mexico and the Waste Isolation Pilot Plant.

Although not a highly visible fixture in this aerial panorama, WIPP has been claimed wholeheartedly by most of the Carlsbad community, according to the mayor.

The reasons: a mixture of economics and good citizenship, says Mayor Bob Forrest, a key WIPP advocate in the community. "Carlsbad is behind this project."

Forrest has been mayor for the past three years and has traveled in Texas and New Mexico with other community leaders to show support for the project. He helped organize busloads of citizens to testify at DOE environmental hearings in Albuquerque and Santa Fe last spring.

'Nothing But Praise' for Sandians

"To keep abreast of what's going on at WIPP, we have relied on information from people like Wendell Weart," Forrest explains. "We've got nothing but praise for the people who have come here from Sandia." Forrest says the dozens of Sandians living or working in the community are an asset. He praises the Labs' "up-front" approach to keeping him and other leaders informed.

Forrest notes that when the WIPP project was getting started, "probably 10 percent of Carlsbad had a positive attitude about it." He estimates 95 percent of the citizens now favor the project. City leaders saw the advantages of the project early and pursued it aggressively.

The people of Carlsbad believe WIPP is safe and promote it on that basis, Forrest emphasizes. If they didn't believe in the project's

safety, they would fight it. "If anybody can stop WIPP, it's the people of Carlsbad."

"But," he says, "if we can help solve our nation's nuclear problems and support a national defense system that is helping to keep our kids out of war, I think it's the bargain of a lifetime. Today, 651 people working at WIPP think it's the best job in Carlsbad. And we've got children from this town coming home from college to jobs for the first time in 10 years."

Slammed by an earlier downturn in the fortunes of the potash industry, Carlsbad has looked at the proposal to bury radioactive wastes in the Delaware Basin in terms of its economic implications. In fact, veterans of the potash industry have helped strengthen support for WIPP because of their knowledge of the area's geology and understanding of the salt and potash formations, Forrest reports.

New Curriculum at NMSU/Carlsbad

An announcement of a DOE-supported waste management curriculum at New Mexico State University's Carlsbad campus is the kind of economic spin-off from WIPP that Forrest and others in the community are hoping for. Sandia is working with the university on the program, which gets under way in January. Covering all types of waste, the program is expected to attract students and ultimately new businesses to the area.

Forrest regards WIPP as a potent aid to regional development, though he concedes that "there will never be enough spin-off to make me happy."

"We've been recruiting businesses for two years and we finally got a 10-employee business to relocate," he recalls. "WIPP can create more new businesses by mistake than we can with all our efforts."

feed iiback

Q. Many Sandia bicyclists pick up aluminum cans on the way to and from work. It's a great way to raise funds for the PTA or church groups; I've been carrying crushed cans in my pack for years. A guard noticed recently that one of the cans in my pack was a beer can. He suggested I not bring a beer can — no matter how crushed — into Area I. Since two-thirds of the aluminum litter in Albuquerque is beer cans, this suggestion made a dent in my philanthropy. Is there really a problem about crushed cans entering the area?

A. Empty aluminum cans, however labeled, are not on our contraband list. Alcohol, of course, is, and empty beer cans inside our security areas make us very nervous — for obvious reasons. Should an empty beer can be found in the area, we have to spend a certain amount of investigative effort to determine the circumstances; we would prefer not to do that. Therefore, I'm supportive of the Inspector's suggestion; however, we cannot go so far as to prohibit an employee's carrying a crushed empty beer can in his or her backpack. If you are stopped on a gate search, you will have to explain the circumstances to the satisfaction of the Security supervisor in charge of the search. Thanks for your interest in security rules. Jim Martin — 3400

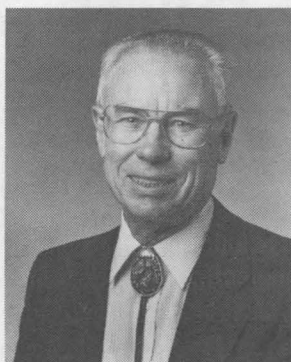
**Earnings Factors
October 1989**

Savings Plan for	Earnings Factors
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AT&T Shares	1.0059
Government Obligations	1.0167
Equity Portfolio	.9776
Guaranteed Interest Fund	1.0072
South Africa Restricted Fund	.9782
Diversified Telephone Portfolio	
Unrealized Appreciation	.9846
Realized Appreciation	.0069*
Savings and Security Plan — Non-Salaried Employees (SSP)	
AT&T Shares	1.0061
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South Africa Restricted Fund	.9764
Diversified Telephone Portfolio	
Unrealized Appreciation	.9853
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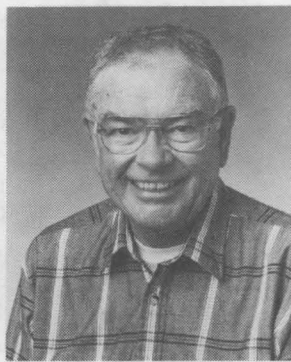
* The 1 has been removed from the earnings factor. Current month's DTP earnings may be calculated directly: Earnings Factor x DTP Current Worth = Current Month's Earnings.



Recent Retirees



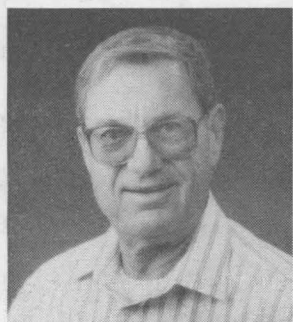
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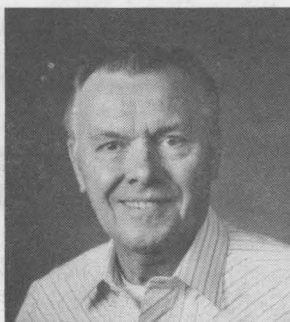
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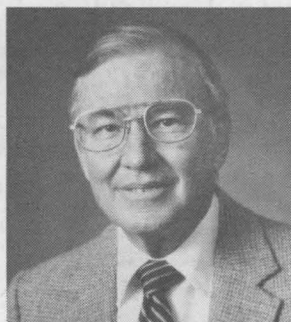
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Robert Morris (1128) 26



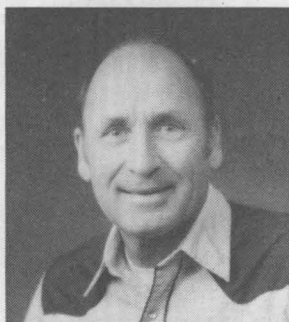
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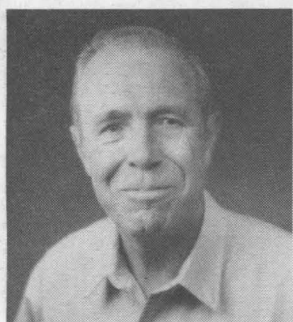
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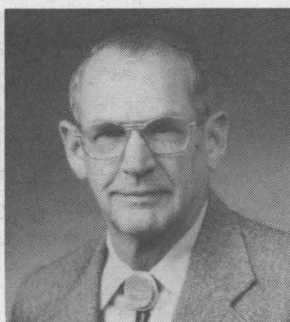
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Connie Coalson (7535) 31



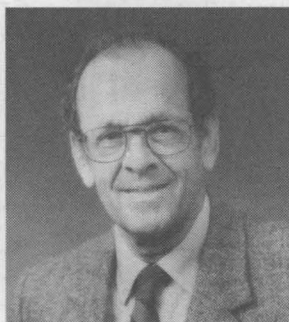
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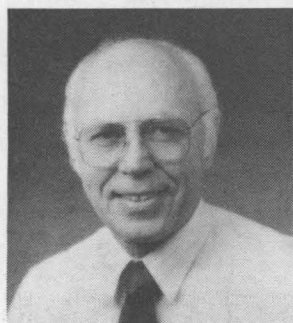
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John Banister (9311) 36



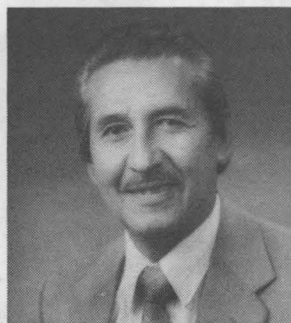
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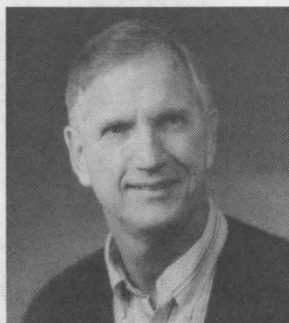
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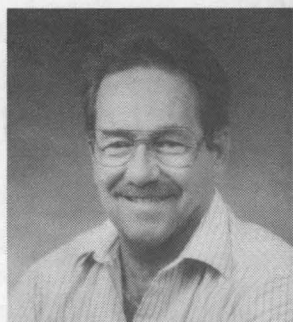
Patte MacPherson (3412) 34



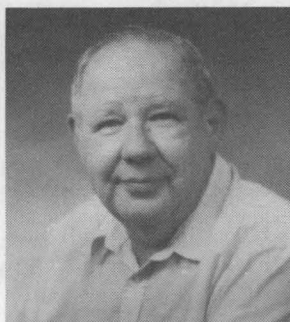
Louis Flores (5113) 37



Don Pitts (3433) 37



Art McCarthy (7554) 31



Jack Travis (2172) 33



Elnora Shurn (3426) 10



Julio Pardo (2551) 33

Fun & Games

Bowling — Here are the winners of the SANDOE Bowling Association 1988/1989 Bowler-of-the-Year Tournament: Scratch — Bob Barton (3745), 659; and Patty Jojola (3731), 499; Handicap — Reggie Tibbetts (7813), 638, 638; and Frances Baca, 467, 617.

October Bowlers-of-the-Month — Scratch: Milt Stomp (6215), 662; and Cheryl Barton, 610; Handicap: Paul Sands (2612), 540, 657; and Dora Gunckel (6400), 577, 685.

November Bowlers-of-the-Month — Scratch: Bob Barton, 684; and Lil Radtke (3437), 585; Handicap: Daniel Baca (7813), 599, 683; and Lea Long, 512, 671.

More Bowling — Winners of the 4-Game Mixer Tournament held at Galaxy Bowl Nov. 11-12 were Ernie and Ella Haralson (guests) with a combined handicap series of 1473. Second place went to Wayne Yoshimoto (7412) and Dee Schumpert (DOE) with a combined handicap series of 1384.

Bowlers are reminded to send the SANDOE Bowling Association \$4 membership fee to Dora Gunckel (6400). Membership privileges include bowling in SANDOE fun tournaments at a reduced rate and eligibility for the Bowler-of-the-Month awards. A series may be bowled in any sanctioned league, and bowlers don't have to be associated with a league sponsored by Sandia. Sandia and DOE employees and spouses are eligible to join.

Officers for the 1989/1990 season were elected recently. They include: Fidel Perez (7485), president; Lil Radtke, vice president; Dora Gunckel, secretary/treasurer; Julia Norwood (3400), women's representative; Daniel Baca, men's representative; and Reyes Chavez (7412), tournament director.

Tournaments scheduled for the rest of the season: Best Ball at Holiday Bowl Jan. 20-21; Team Event at Fiesta Lanes Feb. 17-18; No Tap/Scotch Doubles at Galaxy Bowl March 17-18; and 4-Game No Tap at Holiday Bowl April 21-22.

River Rafting — Retiree John Shunny is organizing another Grand Canyon river trip for next spring, June 1-9, from Lee's Ferry to Lake Mead. By going as a group, the river outfitter discounts the price significantly (\$880 for this trip vs. \$1200 for individuals). The nine-day trip includes all meals and transportation back to Lee's Ferry from Lake Mead. Call John on 265-1620 for further information.

Volleyball — Fall 1989 Volleyball Season League champions have been determined. The leagues and team captains (teams aren't named): A League — Bob Patton (2515), B-I League — Nathan Golden (7400), B-II League — Jill Werner (1414), C-I League — Dora Gunckel (6400), C-II League — John Kelly (3212), and D League — Richard Nygren (6428).

Welcome

Albuquerque — Donald Bragg (6453), Barbara Doremus (7841), Jeffery Downs (2131), Irene Dugger (9213), Karen Kern (7222), David Monroe (6525), Carolyn Raney (2171), David Robertson (3545), Michael Russell (1153), Al Stotts (3163), Edward Weinbrecht (7823); **Other New Mexico** — Mark Lemon (9325), John Ortiz (9325), Jenifer Rivera (2814).

Elsewhere: **California** — James Ang (1534); **Colorado** — Louis Restrepo (6453); **Georgia** — Jacquelynne Hernandez (5145); **Idaho** — Dorothy Stermer (3202); **Illinois** — Richard Schneider (1144); **Missouri** — David Tapscott (2648); **New Jersey** — Robert Winkelman (1164); **Pennsylvania** — Daniel Barton (2142); **South Carolina** — Allen York (5165); **Texas** — Jerry Strother (9116); **Washington** — Scott Unger (2335).

Maybe They Needed One Good Editor

Particle physicists are notorious for putting large numbers of authors on scientific papers. Even so, a report in a recent edition of *Physical Review Letters* seems worthy of mention. The report, describing experiments conducted with the Fermilab Tevatron proton-antiproton collider in Illinois, has 193 authors. Their names and affiliations to 17 different institutions fill nearly one page in a journal that limits published papers to four pages. For the record, the researchers measured the inclusive jet cross section in proton-antiproton collisions. *New Scientist*

And the Door Closed?

Horses prefer having their barn lights on, say two physiologists from Cornell University. Lynn Asinof, *Wall Street Journal*

Congratulations

To Cathy (2858) and Dan (2853) Vortolomei, a daughter, Caitlyn Marie, Nov. 2.

To Cheryl and Ron (7544) Coleman, a son, Andrew Glen, Nov. 8.

To Georgia (3551) Rivera-Gronager and John (5165) Gronager, a daughter, Adriana Marissa, Nov. 13.

To Bobbie (7821) and Jack (9235) Bartberger, a daughter, Jodi Marie, Nov. 25.

To Margo and Kurt (4050) Olsen, a daughter, Randi Jaret, Dec. 1.

To Judy Anderson and Jerry Meyers (5219), married in Albuquerque, Dec. 3.

feed back

Q. Our Provident representative tells me that Sandia writes our medical plan and Provident administers it. I also understand that the purpose of our TLC program — which is wonderful, but costs thousands of dollars — is preventive in nature. Please explain why our medical plan (1) does not cover preventive mammograms; (2) will cover dependent pregnancy (up to age 24), but not birth control pills; and (3) does not cover other preventive measures, such as a lift for an electric cart to assist a handicapped person. Surely, the cost for treating breast cancer or back surgery is more expensive than preventive mammograms or an electric lift.

A. The Medical Care Plan (MCP) is designed to protect plan participants from financial hardship associated with treatment of major medical expenses (such as those associated with illness or

injury), rather than the relatively minor expenses of routine and/or preventive medical care for which the employee can plan and budget, i.e., routine tests or physicals. The MCP benefits structure is modeled after that of AT&T; currently, no changes to cover preventive or routine care are being considered. However, we are investigating the possibility of making the coverage of mammograms consistent with our current coverage of Pap smears.

Although pregnancy generally does not involve injury or illness, maternity expenses are covered by the MCP. This is consistent with federal law, which requires that pregnancy be treated the same as any other injury or illness.

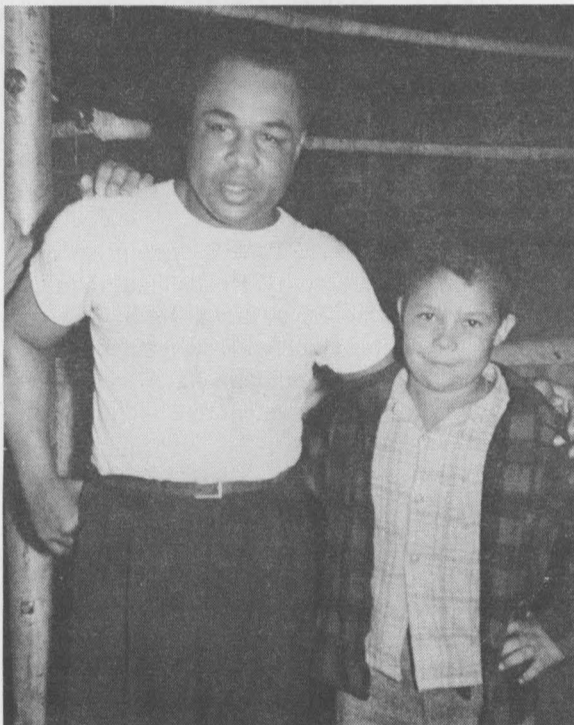
To ensure that our benefits remain competitive, Sandia participates in several annual benefits surveys. The comparison of employer-provided

medical benefits involves many factors such as plan design, co-insurance, deductible, employee contributions, etc. According to a national survey, when all these features are considered, the Sandia Medical Care Plan is considered to be above average. Most company health plans do not provide coverage for routine/preventive care or charges not associated with medical treatment such as a lift mechanism.

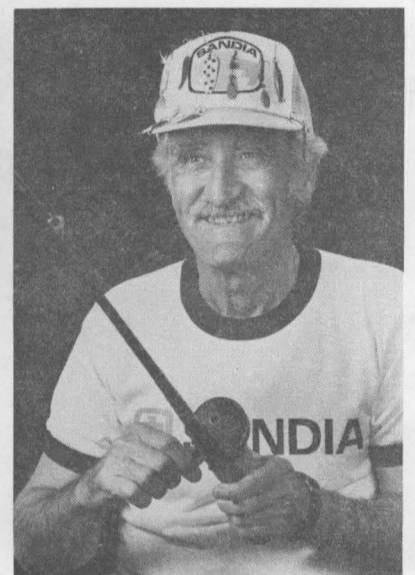
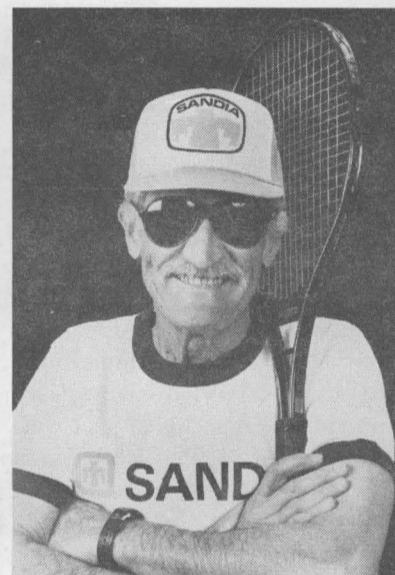
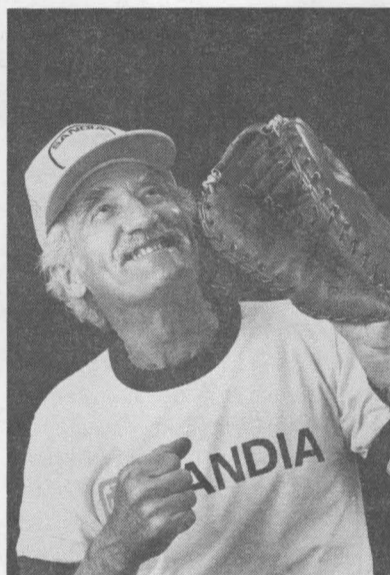
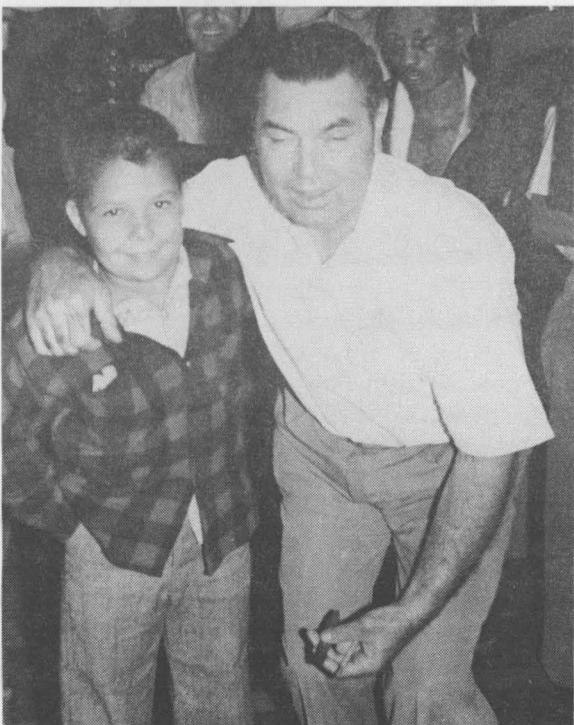
Sandia agrees that wellness and preventive care are important; that is why the Total Life Concept (TLC) program — administered by Medical Dept. 3330 — was developed. However, we hope that rational medical care or equipment is not sought purely on the basis of whether or not the cost will be reimbursed.

Ralph Bonner — 3500

Favorite Old Photos



Back in the late '40s, I was an avid boxing fan; I took my son Richard (now 9233) to many matches at the old Armory in Albuquerque. I also took along my camera to record some of the action — and to shoot pictures of Richard and some of the "older" fighters who came to town for the events. Top photo shows Richard — at age 11 — with Henry Armstrong, who'd been the world lightweight champion in 1938 and the world welterweight champ from '38 to '40. A couple of weeks earlier, Richard had posed (below) with Jack Dempsey — the heavyweight champ between 1919 and 1926. No, Dempsey wasn't punch-drunk; I happened to catch him with his eyes half-closed.—Tony Gallegos (ret.)



THOSE SANDIA T-SHIRTS AND CAPS are great for any kind of sport, as John Shunny (ret.) demonstrates. Proceeds from the sale of these versatile garments go to the South 14 Village Project, started in 1966 to aid needy families in the villages south of I-40 along South 14 (now 337) — Escabosa, Chilili,

Tajique, Torreón, Manzano, and Punta. John and Julian Sanchez (also ret.) coordinate the project, which has donated \$2210 to others in 1989. If you're looking for a last-minute holiday gift or a happy-new-year present, the shirts and caps (\$7/each) are available at the LAB NEWS office in Bldg. 814.



THE SANDIA BRASS ENSEMBLE made its debut a year ago, when it entertained patrons of the company cafeteria just before the holiday break. The group, now 12 members strong, made a repeat performance at the cafeteria earlier this week and entertained at several other events throughout the year, including the Coronado Club's 4th of July picnic. Surrounding Rod Woy (3154, seated in front), part of the Ensemble at a recent practice session includes (from left) group leader Chuck Guthrie (2852), Rich Carson (2531), Rudy Jungst (2512), and Randy Simons (9224). Other members of the group are Paul McKay (1275), Steve Sobolik (7537), Rich Anderson (2142), Dave Eley (6315), Bob McInteer (3153), Gary Rochau (1272), and Eric Hendrine (USAF).

feed **back**

Q. Is there any way to improve vending services at Sandia? There's very little effort expended to keep the machines filled, and product selection varies from machine to machine. It is not unusual for a machine to stand empty — or nearly so — for several days. Because of the number of complaints, the supply of refund envelopes is constantly depleted. The vending machines at Sandia ought to be a virtual gold mine, but disgusted customers walk away shaking their heads and mumbling about their resolve never to come back. It's time Sandia required performance on its contracts, on everything from vending machines to computers.

A. Vending services have long been a recurring problem at Sandia, both because of our se-

cured environment and because of the lack of contract control by the Labs. Most employees are unaware that Sandia does not control the contract with the vending organization. All federal and state — and some city and county — agencies are affected by 1974 legislation that dictates that all vending and food services for these sites will provide profits to the Commission for the Blind. Sandia's vending arrangement falls under this directive. The contract for our vending services is between the N.M. Commission for the Blind and — currently — Service America Corporation (SAC). Sandia has no direct involvement in contract selection or performance monitoring.

SAC has recently undergone a management change that should provide positive changes for Sandia. The new operations manager is familiar with Sandia and its needs. He has personally made Sandia his first priority until things are operating as they should. In the first of many changes, SAC recently installed over \$55,000 worth of new equipment. More new equipment is on order, and some of the remaining machines will be overhauled.

SAC has many obstacles to overcome, in that it has 130 machines at Sandia and only two people with clearances to service them. Most machines are filled more than once a week, and some are filled on a daily basis; that rate can't be improved without more cleared people. Though clearances for other service people are in process, average clearance time is more than 19 months.

SAC manager Steve Scott would like to hear from you when you have a problem. He can be reached on 344-1626. Likewise, you can contact Linda Stefoin (3543) on 4-7433 regarding vending

service problems. Linda can also provide refund envelopes — or fill one out for you.

Ralph Bonner — 3500

Q. ES&H Bulletin #38 had a good discussion on bicycle safety. However, one statement needs further clarification. Safety Rule 7 says "Do not cycle at night while at SNLA." As you know, a good share of the year it is dark when many Sandians are coming to work early or going home after 5 p.m. I trust the rule does not apply to these normal coming and going times, particularly when Rule 15 clearly states bicycles are to have lights and reflectors.

A. The rule listed in ES&H Bulletin #38 concerning nighttime bicycle riding does not apply to Sandians making their way to and from work during early-morning or dusk-to-dark hours. While we would prefer that Sandians not ride during these hours, we realize that situations as described in your Feedback do occur.

When a bicyclist is forced to ride under these conditions, his or her bicycle should be equipped with a light and properly located reflectors. We also recommend that the bicyclist wear some type of reflective clothing, in addition to a bicycle safety helmet — precautions that will also assist during rainy or foggy conditions.

Riding a bicycle at KAFB during evening hours is a high-risk activity. Roads leading to and from many Base facilities (including Sandia) are two-lane and not provided with designated bicycle lanes. Evening bicycle incidents have occurred on KAFB in the past. One incident resulted in significant injuries and a fatality.

Nestor Ortiz — 3200

Medical Corner

Surviving the Holidays: For Some People, It's Not So Easy

By Florence Parnegg, Family Counselor
Alcohol and Other Drug Abuse Program

December means holidays. For some people, it's "party time"; for others, it's a time to feel out-of-sync with the holiday crowd.

Feeling sad — or depressed — or out of place when others are celebrating isn't uncommon. Sometimes those feelings crop up when you least expect them, but there are ways to cope.

Take traditions, for example. Most people remember, with some fondness, their family holiday traditions, especially those in childhood. Now, as adults, "doing things the same way" isn't possible, and it's saddening. The way out? Start a new holiday tradition or two. They may not seem like much at first, but after a few years, they'll begin to seem comfortable — and comforting.

Feeling lonely or left out? Maybe that new tradition you're looking for is staring you right in the face: helping out in one of the many holiday projects for people who may be much lonelier than you are, or in much greater need. A few hours of volunteer time — and sharing with others — might just be a way out of the holiday doldrums.

If there's a problem with alcohol in your family, the holidays may seem an especially trying time. Alcohol is a sedative and acts as a depressant; therefore, during this time when many people experience the "holiday blues," drinking alcohol may exacerbate your problems.

If alcohol and/or other drugs are causing problems in your life, get professional help: Call me on 844-3993 from 7 a.m. to 5 p.m. Outside those hours, our hot-line number is 265-2900. For those in recovery from alcohol and other drug-related problems, or family members who are recovering, this is the time to attend group support meetings; at Sandia, they include:

- Adult Children of Alcoholics — Monday, 11:30 a.m.-12:30 p.m., Bldg. T-13
- Codependents Anonymous* — Tuesday, 12 noon-1 p.m., Bldg. 825 (TTC)
- Al-Anon** — Wednesday, 11:30 a.m.-12:30 p.m., Bldg. T-13
- Alcoholics Anonymous — Friday, 11:30 a.m.-12:30 p.m., Bldg. T-13

*A 12-step program for people with any kind of problem — relationships, work-related, emotional, alcohol, drugs, etc.

**For those with relatives or close friends who have alcohol problems

Dang Near Demands It

Detry Deserves Redress

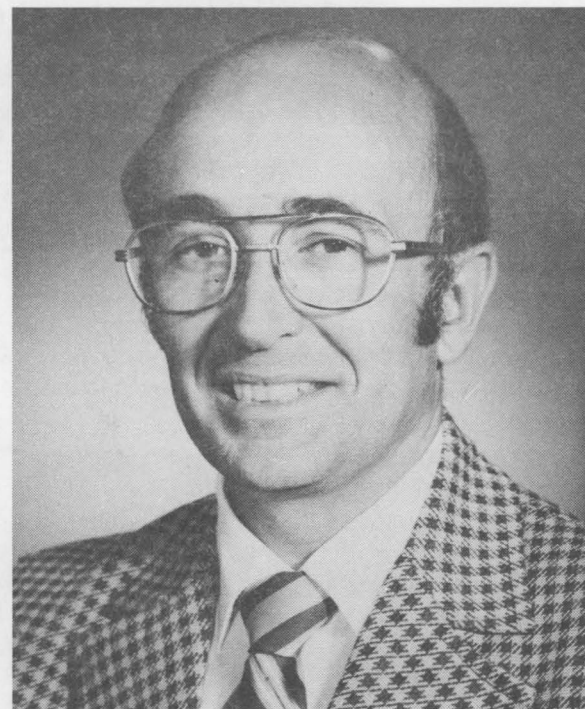
Although destruction of still-serviceable Labs property is generally frowned upon, Ron Detry, Director of Engineering Design at Livermore (8200), was moved by a photo in the Nov. 1 LAB NEWS to request (via memo) that fellow director Herb Pitts (3100) do some destruction anyway. In Ron's words, "Herb, old friend, could you please sneak down to the Archives you keep in the catacombs somewhere, locate that print and corresponding negative, and destroy them?"

Maybe if the photo had been in a historical section, Ron would have grinned and borne it. Trouble was, it was in a story in which Sandia directors talked about the future. But let Ron make his own case:

"For some time I have been working to overcome my well-deserved image as a geek mathematician. Over the years, I have cut my sideburns, turned my hair grey (with help from colleagues), learned to speak English as a second language (after computerspeak), and improved my wardrobe with considerable help and encouragement from my wife. I thought I was making a little progress — but then, a major setback occurred. The special November 1, 1989, issue of the LAB NEWS ran a picture of me from my Neanderthal period (circa 1980) . . .

"As part of my image enhancement, I got rid of that plaid Western-style sport coat several years ago. I gave it to Goodwill. (Twice — they rejected it the first time, but I hid it in a large pile of used sweatsuits the second time and ran before they found it.)

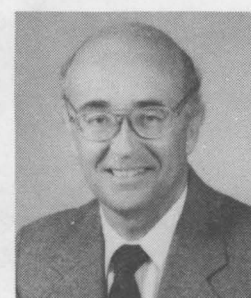
"Others may want you to keep running ancient likenesses for their own reasons. But like a fine wine, I believe I have improved with age, and



RON DETRY (8200) posed proudly in his sideburns and new double-knit sport coat in about 1980.

only now am beginning to sour."

In the spirit of Ron's request, and in the interest of journalistic balance, the LAB NEWS is pleased to publish a more current photo of him, along with the regrettable and now-retired image. After all, fair is fair.



THE NEW
RON DETRY

Take Note

Rochelle Lari (2000) has been selected to represent the Duke City Professional Business Women at the state PBW Young Career Woman Speakoff next April. Rochelle won the recent Duke City Speakoff to qualify. Lorraine Elliott (2116) is 1989-90 chairman of the Duke City PBW Young Career Woman Committee. Mary Ann Lindsay (4000-1) is Duke City PBW president.

Want to learn about a simple and effective software cost-estimating tool? The REVIC Software Cost-Estimating Model Users Group is meeting Jan. 11 and 12 at UNM. The REVIC model is a public-domain cost-estimating tool based on the TRW model, COCOMO. If you are interested in attending the REVIC Users Group meeting or would like a copy of the REVIC model and user's manual, contact George Trever (9215) on 4-4882.

A call for entries has been announced by the New Mexico Arts and Crafts Fair for the 29th annual fair to be held June 22-24. Only New Mexico residents may enter, and all media are eligible. Ju-

rying will be Feb. 1-4 at the New Mexico State Fairgrounds. For a prospectus, contact the NMACF on 884-9043.

Retirees interested in continuing their education are invited to join senior citizens at Bear Canyon Senior Citizens Center for weekly seminars on natural and social sciences. Topics are chosen by members. For information, call Joseph Schwitter on 298-4022.

Alliance Française d'Albuquerque is again offering French conversation classes for different ability levels — beginning through advanced. The 10-week spring session begins the week of Jan. 29. Classes are taught in a relaxed atmosphere in instructors' homes. Emphasis is placed primarily on conversational skills. Cost is \$56, plus \$7 for student membership in the Alliance. For information, contact Therese Mueller on 842-4266 or 345-1972.

UNM's seventh Symposium on Space Nuclear Power Systems will be held Jan. 7-10 at the Albuquerque Convention Center. Scientists are ex-

pected from the People's Republic of China, the Soviet Union, Japan, France, and the United Kingdom. A catch-up short course on space nuclear power key technologies will precede the symposium on Jan. 5-6 at the Doubletree Hotel ballroom. On Jan. 10, a special evening session on "Galileo and Ulysses: Successors to Voyager" will be held from 7-9 p.m. For information, contact Mary Bragg on 277-2813 or Neal Singer on 277-1813.

Sandia is assisting Choate Rosemary Hall in identifying two New Mexico high-school sophomores for Choate's Junior Year Young Science Scholars Program. Choate Rosemary Hall is an independent secondary school in Wallingford, Conn. Primary program goal is to help future leaders gain insight into problem-solving through the use of modern instrumentation and computer technology. Scholars reside at Choate during their junior year and take courses there. All Scholars receive merit-based tuition scholarships. Other aid is available. Dick Lynch (6300) is a Selection Committee member. For applications (due by March 12) and information, contact Ruth Bitsui (3511) on 4-8976.

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

STATIONARY BICYCLE, Sears Ergometer model; Dynafit ski boots, Lady Pro, size 7, \$30. Navratil, 293-5527.

KING-SIZE WATER BED, baffled construction, w/frame, heater, side rails, sheets, \$100 OBO. Carlson, 897-1850.

TWIN-SIZE STUDIO COUCH, \$40. Holmes, 292-0898.

CAT, 2 yrs. old, needs caring home, free. Tidmore, 884-1870.

WHITE GERMAN SHEPHERD PUPPIES, registered. Mathes, 832-6676.

MANZANO LETTER JACKET, girl's large size, \$40. Burford, 865-8486.

REMINGTON .22-CAL. RIFLE, \$90. Greene, 299-4163.

QUEEN-SIZE WATER BED, w/heater, \$50. Stirbis, 299-8442.

ORIGINAL CONTOUR LOUNGER, \$600 OBO; tan leather adjustable chair, \$600 OBO; 1950s limed-oak dining table & chairs, \$200 OBO. Montoya, 884-5174.

CRISTIFORI UPRIGHT PIANO, \$800; DP Ultra Gympac, \$275; Cleopatra pinball machine, \$500. Stephens, 822-8584.

YAMAHA SAXOPHONE, \$500 OBO. Splichal, 256-7046.

LAB/SHEPHERD-MIX PUPPIES, 3 females, 2 males, free. James, 265-4015.

ENCYCLOPEDIA AMERICANA, 1956 edition, yearbooks to 1969, Book of

Knowledge, Lands and People, \$75. Schuster, 299-1072.

ANTIQUA SPINNING WHEEL, small upright, \$275; new La-Z-Boy rocker/recliner, w/swivel, blue, cost \$538, sell for \$488. Brooks, 298-8448.

STEREO SPEAKERS, Leslie model DVX 570, 15" woofer, walnut cabinet, \$200. Braithwaite, 822-1998.

UPRIGHT FREEZER, 12.1 cu. ft., \$250 OBO; DP weight machine, accessories, \$250 OBO; exercise bike, \$35 OBO. Baird, 891-5497.

INSULATED WIND PANTS, for skiing, full side zippers, man's large size, \$35. Loucks, 281-9608.

SINGLE BED, w/headboard, metal frame, \$150; Nash skateboard, \$40; child's desk, \$40. Beck, 299-7225.

CANON AE-1 SLR CAMERA, w/5 lenses, flash, other accessories, total price depends on items actually purchased. Lawrence, 296-3058.

MOVING BOXES and packing paper, enough for a 3-bdr. home, worth approximately \$250 at U-Haul, sell for \$100. Ottesen, 292-7147.

KENMORE GAS RANGE, gold, \$130 OBO. Martinez, 884-5047.

KING-SIZE BEDROOM SET, dresser, mirror, headboard, \$350 OBO. Wiczer, 296-4496.

DRESSER, \$35; bentwood rocker, \$35; antique Singer sewing table, w/glass top, \$35. Levan, 344-9794.

ORANGE TWEED SOFA, Early American style, \$95; La-Z-Boy swivel rocker, blue/green velvet, \$95. Trembl, 292-9219.

SEWING MACHINE, Sears Zig-Zag, maple cabinet, accessories, \$50; green velvet occasional chair, \$35. Coleman, 884-5009.

CHINA HUTCH and server, \$500; dining room table, 1 leaf, 6 chairs, \$150. Trever, 298-3044 after 7.

PARAKEET, cage & goodies included, free. Maxwell, 294-9073.

BOWLING BALL, Columbia 300, 11 lbs., AMF bag, size 6-1/2 Brunswick shoes, all brown, \$35. Wilde, 281-4511.

KING-SIZE WATER BED, complete w/12-drawer pedestal and bookcase headboard, \$300 OBO. Tooker, 865-7437 after 5:30 or weekends.

ROWING MACHINE, \$65; exercise bike, \$40; dot-matrix printer, \$50; amber monitor, \$50; Haig irons, Maltby irons, \$130. Meyer, 821-0123.

WHIRLPOOL BATH, Sears, for bathtub, w/attachments, \$65. Miller, 268-5992.

PIONEER LASER VIDEO DISC PLAYER, cost \$400, sell for \$200; 85-205 Vivitar zoom lens, Nikon mount, \$50. Laskar, 299-1024.

NORITAKE CHINA, service for 4, \$45; infrared heat lamp, \$10; 96" sofa,

\$250; Berkline reclining chairs, \$100/ea. Krahling, 268-8126.

TWO SEASON TICKETS to New Mexico Repertory Theatre, for balance of year, \$120 OBO. Robb, 821-2999.

CITIZEN 180-D DOT-MATRIX PRINTER, cable, ribbon, fan-fold paper, \$125; Intel 8087-1 math co-processor, never used, \$125. Brosseau, 828-1596.

TWO SANDIA PEAK STOCKHOLDER SEASON PASSES, \$225/ea.; cherry canopy bed, complete, \$425. Elliott, 299-2782.

CHILD'S BICYCLE HELMET, never used, \$15; child's bicycle seat, \$5. Herr, 281-8275.

ATARI 1040 ST COLOR SYSTEM, never used, software included, \$750 OBO. Houghton, 255-3529 after 5.

BOOSTER CAR SEATS, Cosco Explorer and "wing-type" brands, \$10/each. Lamppa, 299-1119 evenings.

OAK FLOORING, tongue & groove, new, pre-finished, 87 sq. ft., \$100. Caffey, 296-1942.

QUEEN-SIZE HIDE-A-BED, \$125; rowing machine, \$100; Necchi sewing machine and cabinet, \$75. Keltner, 298-7888.

CLASSICAL GUITAR, Juan Orozco 1976 No. 64-U-1, including Hopf hardshell case and strings, \$400. Linebarger, 275-7931.

PRE-800 TEAM SKIS, 170cm, new, \$70; Rossignol skis, 180cm, \$15. Norwood, 292-0072.

MAYTAG WASHER, large-capacity, almond, \$190; Whirlpool electric dryer, \$60. Baack, 822-8299.

TRANSPORTATION

'84 FORD BRONCO II, fully loaded XLT package, 4x4, AC, AT. Riley, 293-5868.

DIRT BICYCLE, \$50. Beck, 299-7225.

'85 CHEV. BLAZER S-10, 4-WD, one owner, 42K miles, AC, AM/FM, power, \$7500 OBO. Olson, 299-8678.

'65 GMC 230 PICKUP, 6-cyl., short box, \$750 OBO. Ortiz, 873-8711.

10-SPD. BICYCLE, Sears, \$50 OBO. Carlson, 897-1850.

'88/'89 TRICK STAR BICYCLE, new, \$150. Galloway, 822-8336.

'77 CHEV. PASSENGER VAN, 350 V-8, 83K miles, AT, PS, cruise, AC, AM/FM, \$2400 OBO. Romero, 296-0521.

'71 FORD COUNTRY SEDAN SW, 400 CID engine, AC, radio, one owner, \$875. Halbleib, 296-2682.

'84 MAZDA GLC DELUXE, 5-spd., AC, 4-dr., AM/FM cassette, 72K miles, sunroof, silver exterior, \$3195 OBO. Carson, 293-7162.

REPOS: '84 Dodge van B-150; '83

Chev. Camaro Z-28 sport coupe; '77 Datsun 810 wagon; bids accepted through Dec. 27; we reserve the right to refuse all bids; subject to prior sale. SLFCU, 293-0500.

'80 MAZDA RX7, 5-spd., AC, AM/FM cassette, sunroof, louvers, car cover, sheepskin seat covers. James, 294-6837.

'82 FORD ESCORT, 2-dr., manual, \$1450. Stirbis, 299-8442.

'76 TOYOTA CORONA WAGON, AC, 5-spd., luggage rack, \$550. Kasper, 884-4697.

'89 CHEV. SILVERADO EXTRA-CAB PICKUP, 1/2-ton, 4.8K miles, loaded, 8' bed, sky blue color, special towing package, make offer. Salgado, 823-1420 evenings.

'78 KAWASAKI KE175B-2 MOTORCYCLE, extras. Shelby, 292-4605.

'76 FORD 3/4-TON PICKUP, 4x4, 360 V-8, 4-barrel, 4-spd., new tires & brakes, 77K miles, AM/FM stereo, lock-in hubs, 411 gears. Garcia, 1-864-2453.

'82 VW VANAGON-L, 7-passenger, all service records, 63K miles, \$3800. Caffey, 296-1942.

'81 HONDA ACCORD LX HATCHBACK, 5-spd., AM/FM cassette, 120K miles, original owner, \$2400 OBO. Warren, 275-1364.

WOMAN'S 5-SPD. BIKE, \$35. Keltner, 298-7888.

'88 JEEP CHEROKEE LAREDO, 6-cyl., PW, PL, AT, hitch, stereo, cruise, 4-dr., \$14,700. Huber, 822-1891.

CANNONDALE CUSTOM BICYCLE, 62cm, w/Look pedals, Shimano 600 Ultegra components, \$1000. Pitts, 299-0271.

'78 THUNDERBIRD, white/red top, new brake system, bucket seats, crack-free dash, \$1500. Packwood, 883-2772.

REAL ESTATE

2-BDR. HOME, near downtown, 1 bath, 1100 sq. ft., extras, \$59,500. Menicucci, 842-6330.

2-BDR. CONDO, full bath, private patio, FP, garage, near Wyoming/Spain NE, \$55,000. Sebrell, 821-4227.

3-BDR. MOBILE HOME, on permanent foundation, includes 2-bdr. addition, Bosque Farms, \$45,000. Eaton, 869-3622 or 299-7271.

3-BDR. CUSTOM HOME, Alto Village, 2 baths, sunroom, hot tub, country club membership, \$144,900. Hopper, 1-746-6705.

PATIO HOME, Tramway/Rover area, 1720 sq. ft., 2 master bedrooms, 2 baths, great room w/FP, 2-car garage, \$109,900. Schkade, 292-5126.

4-BDR. HOME, plus study, 2560 sq. ft.,

brick, DR, LR, FR, kitchen/breakfast room, double garage, Juan Tabo/Comanche, \$128,900. Bonzon, 296-3022.

4-BDR. HOME, Glenwood Hills, 3400 sq. ft., \$51.50 per sq. ft. Dunn, 296-4904.

3-BDR. HOME, Four Hills Addition, 1650 sq. ft., 1-3/4 baths, double garage, landscaped, new paint. Turner, 293-8938.

WANTED

SET OF WORLD BOOK ENCYCLOPEDIAS. Montoya, 884-5174.

SIAMESE SEAL POINT SERVICE, unregistered OK. Stephens, 822-8584.

HOUSEMATE, share NE Heights home, Lomas and Louisiana area, nonsmoker preferred, \$300/mo., utilities negotiable. Hobbs, 268-6461.

TWO UNM BASKETBALL TICKETS, for East Carolina game Dec. 27. Alpert, 294-1247.

REFRIGERATOR, prefer Sears or GE, less than 10 yrs. old, off-white, frost-free, home ready 1/24/90. Ricker, 293-1847.

DOGHOUSE for big dog. Hunter, 865-5745.

NORITAKE CHINA, Barbara pattern, especially need cups & saucers. Spradling, 292-4680 evenings.

SMALL TRUCK, must be mechanically sound and in good condition, for new employee in need of dependable transportation. Ortiz, 888-6360.

CAMCORDER to borrow or rent, for baby's first Christmas, VHS format, would make out-of-state grandparents very happy. Parson, 291-8394.

HOUSEMATE, nonsmoker, female preferred, 3-bdr. NE home, 1-1/2 baths, must like cats, \$200/mo. plus 1/2 utilities. Hutchins, 883-8821.

PATIO SWING, non-stationary; queen-size headboard w/bookshelf; end tables; headboards for twin beds. Long, 294-4591.

REFRIGERATOR, washer, dryer, prefer beige or almond. Davis, 294-1048.

LOST AND FOUND

FOUND: earring, on mall between Bldgs. 891 and 893 on 12/12/89. Padilla, 299-2637.

SHARE-A-RIDE

FULL-TIME VANPOOL SEATS AVAILABLE, along N-14 and Frost Rd., \$34/mo., ride every day. Rentzsch (281-5017) or Burns (281-3922).

Coronado Club Activities

Celebrate the Holidays: Two Nights in a Row

THERE MAY STILL BE ROOM at the annual C-Club holiday party tonight; find out by calling the office. Main menu attraction is prime rib (gentleman's cut, \$7.95; lady's cut, \$6.95). After dinner, served from 6 to 9 p.m., enjoy dancing to the variety music of Together from 8 until midnight.

A HOEDOWN — ISLETA-POOR-BOY STYLE — helps get the holiday break off to a rip-roaring start tomorrow night (Dec. 23). Chow-line choices, served from 6 to 9 p.m., are New York sirloin strip (\$7.95) or stuffed shrimp (\$6.95). Levis & Lace, a square-dance group, demonstrates some fancy footwork from 7 to 8, and the Poor Boys strum their sagebrush-shuffle specialties from 8 to midnight. The kitchen ranch hands need to know how many sirloins to strip and shrimp to stuff, so help them out with a reservation call (265-6791).

THAT HARD-WORKING C-CLUB CREW needs a break like the rest of us, so they'll shut down for some much-needed vacation from Dec. 24 through Jan. 1 (with the exception of New Year's Eve, of course).

SWING YOUR PARTNER — Starting Wednesday night, Jan. 3, and continuing every Wednesday night in January and on into February, you'll have a chance to learn the ins and outs of square dancing — and get some great exercise, too — during dance lessons at the Club. A caller will be on hand each Wednesday from 8 to 10 p.m. to lead you through some fancy — and not-so-fancy — dance routines. Lessons are free on Jan. 3, 10, and 17; thereafter, pay just \$10/couple for four more weeks of lessons. Your square-dance ticket is available from the Club's publicity office; call 265-6791 for more info.

BINGO FANS get their next chances to hit the jackpot three times in January: on the 4th, 11th, and 18th. It's a brand-new year, but the same old prices — single package/\$5, double package/\$9, and triple package/\$13. Card sales start at 5:30 p.m., and the early-bird game begins at 6:45. Reasonably priced food available throughout the evening.

T-BIRD CARD SHARKS START THE NEW YEAR RIGHT with another gaming session on Jan. 4, starting at 10 a.m. Come on out for gratis goodies, convivial conversation, and all kinds of card games.

A PRIME-TIME OPPORTUNITY'S IN STORE on Friday night, Jan. 5; the dinner menu features prime rib, with a gentleman's or lady's cut available (\$7.95 and \$6.95, respectively). For those

with dinner reservations, free country-western dance lessons are available from 6 to 7 p.m. Afterward, the Isleta Poor Boys play stomp music from 8 to midnight.

MARK JAN. 6, 1990, ON YOUR CALENDAR. That's because Family Night that evening features one of 1989's most popular movies — "Honey, I Shrunk the Kids" — on the big screen at 6 p.m. There's plenty of low-cost food available starting at 5. Movie admission is free.

PLANNING TO SEE A MOVIE or two during the holiday break? Stop by the Club office ahead of time and purchase tickets at big discounts. Costs are \$3.25/Creative Entertainment, \$3.25/United Artists, and \$4/General Cinema; tickets may be used at any time of day or evening.

For Retirees Only

The Check Is in the Mail . . .

When Congress passed the Medicare Catastrophic Care Act, it recognized that several groups of Medicare beneficiaries already had supplementary coverage from their employers (examples: the Labs-provided Medical Care Plan at Sandia, Albuquerque, and HMO at Sandia, Livermore).

Therefore, Congress added a provision requiring compensation of retirees in such plans, since employers would be saving because of Medicare's increased benefits.

When Congress voted to repeal the Medicare Catastrophic Care Act, it did not repeal this refund

provision for 1989. Therefore, Sandia retirees and their dependents who had Sandia-paid coverage and Medicare as the *primary* payer of health benefits in 1989 will be receiving — or may have already received — a one-time payment from Provident.

The payment, which will not be repeated next year, represents the value of duplicated services provided by Medicare. Retirees who believe they are eligible for the refund and do not receive one by Jan. 15, 1990, should call the Sandia Benefits Department on (505) 844-3545.

Events Calendar

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

Dec. 22-30 — "The Second Shepherd's Play," version of medieval cycle play that tells the tale of Mak the sheep-stealer and his wife Gill; 7 p.m. Thurs.-Sat., Vortex Theatre, 247-8600.

Dec. 22-Jan. 19 — "One and Ten Thousand Marks," drawing exhibit of works by four Taos artists; 9 a.m.-4 p.m. Tues.-Fri. (5-9 p.m. Tues.); UNM's Jonson Gallery, 277-4967.

Dec. 22-Feb. 15 — Exhibit of Eliot Porter photos taken between 1940 and 1983 of various New Mexico locations; 9 a.m.-5 p.m. daily, New Mexico Museum of Natural History, 841-8837.

Dec. 22-March 4 — Exhibit, "Adventures West," 50 masterworks from the National Cowboy Hall of Fame and Western Heritage Center, including paintings and sculptures by Frederic Remington, Charles Russell, Olaf Seltzer, N.C. Wyeth, Joseph Sharp, and members of the Taos Society of Artists and Cowboys Artists of America; 9 a.m.-5 p.m. Tues.-Sun.; East Gallery, Albuquerque Museum, 243-7255.

Dec. 27-Jan. 7 — "Alfred Stieglitz Loves O'Keeffe," New Mexico Repertory Theatre production of a play based on the May-December marriage of Stieglitz and Georgia O'Keeffe; 8 p.m. Tues.-Sat., 2 p.m. matinee Sat. & Sun.; KiMo Theatre, 243-4577.

Dec. 30 — "Ozark Storytellers," visiting group gives Chautauqua-style performances; funded by the New Mexico Endowment for the Humanities, intended for adult and older school-age children; 10 a.m., free, Albuquerque Museum auditorium, 243-7255.

Jan. 6 — Pops Concert IV: Viva Flamenco

with Maria Benitez, New Mexico Symphony Orchestra conducted by Roger Melone; 8:15 p.m., Popejoy Hall, 842-8565.

Jan. 8 — Monthly Monday Lecture Series: "Indian Education," by UNM Prof. Margaret Szaz; 10 a.m., Indian Pueblo Cultural Center, 296-0766.

Jan. 9 — Subscription Concert III: "A Night in Vienna," Chamber Orchestra of Albuquerque with soprano Urszula Sulkonska; 8:15 p.m., St. John's United Methodist Church, 881-0844.

Jan. 10 — Ballet Folklorico, folk dances; 8 p.m., Kiva Auditorium, 848-1374.



RHINOS ARE CHAMPS in flag football for this year's Sandia Football Association season. The Rhinos finished 9-1, defeating the Pogguns 26-20 in the championship game of the league tournament. Emphasizing their number-one status are (from left, back row) Dave Szklarz (contractor), Robert Vargas, Daryl Reckaway (both 7482), Mark Stavig (7472), Terry Litts (7481), (middle row) Ron Sorley (7481), Terry Smith (7483), Kraig McKee (7485, part-time coach), Dan Hughes (7481), (front row) Tom Davis (7472), Jo Bridge, and Joe Sanchez (both 7482). Not pictured: Doug Abrams (7481).