

No Doubt about It — Tonopah Test Range Is One of a Kind

By John German (7162)

It's 4 a.m. in Las Vegas, Nevada. A familiar Sandia Thunderbird guides us through the early morning darkness to an inconspicuous building on the outskirts of the Las Vegas airport. A Ross DC-9 hums behind us.

Four days a week, about 60 Sandia employees gather at this modest Sandia outpost to begin their 10-hour workdays at Tonopah Test Range (TTR), a Labs-operated testing facility located 150 miles northwest of Las Vegas. On this particular morning, LAB NEWS photographer Randy Montoya and I are visiting TTR to record our impressions of a Sandia very different from the Labs most employees know. We're here this early because a test is scheduled for sunrise, one of many tests performed on the range each year.

Inside, a security guard checks our credentials. As we board the DC-9, Roy Johnston (2713) welcomes us to the "Sandia red-eye flight." It's his turn to be flight attendant, he says as he offers us doughnuts and coffee, a duty he and his co-workers share.

During the 35-minute flight, most passengers steal a few extra winks while others discuss the day's activities. Today, several seats are empty. When a morning test is scheduled, Roy explains, a skeleton crew stays near the range overnight, either at a nearby Air Force dormitory or in Tonopah, a former silver mining town 45 minutes north of the range.

A High-Tech Desert Oasis

At 5:05, our plane touches down on a remote airstrip that Sandia shares with the Air Force's F-117 Stealth fighter wing. At least 50 of the bat-like fighter jets are hidden nearby under hangars, reminding us that, as a whole, this high-tech oasis on the Nevada desert has seen the development of much of the US's modern weaponry. (See "Air Force Thanks TTR People for Keeping Secret" on page seven.)

Within minutes, we arrive at the TTR command post, a fenced-in collection of buildings, antennas, and control tower that is Sandia's most remote tech area. Sandians scatter to ready for today's test, but soon discover that they woke up at 3 a.m. for nothing; the test has been postponed indefinitely. "All in a day's work," muses TTR test director Joe Dykes of Range Operations Dept. 2713. (See "Few Moments of Gathering Data Only Part of the Job" on page ten.)

TTR itself occupies 525 square miles of desert valley situated between two north-south-running mountain ridges. A series of dry lake beds dots the valley. Beyond a low ridge to the southeast lies Nellis Air Force Base, where many of the Air Force's fighter and bomber pilots practice warfare maneuvers year-round in "Red Flag" drills. Beyond

(Continued on Page Six)



THIS IS NO DESK JOB — Lance Wilson (now retired) adjusts optics on one of many tracking telescopes equipped with high-speed cameras at Sandia's Tonopah Test Range. (Photo by Randy Montoya)

Technique from Weapon Monitoring

Sensor Reads Glucose Levels 'Bloodlessly'

About 2.5 million diabetics track their blood sugar levels with home monitors that require pricking a finger, sometimes four or more times a day. The tests are painful and inconvenient. They can cause fingertip calluses that make the sampling even more painful and difficult. And the monitors can't indicate changes in glucose levels or show the rate or direction of change.

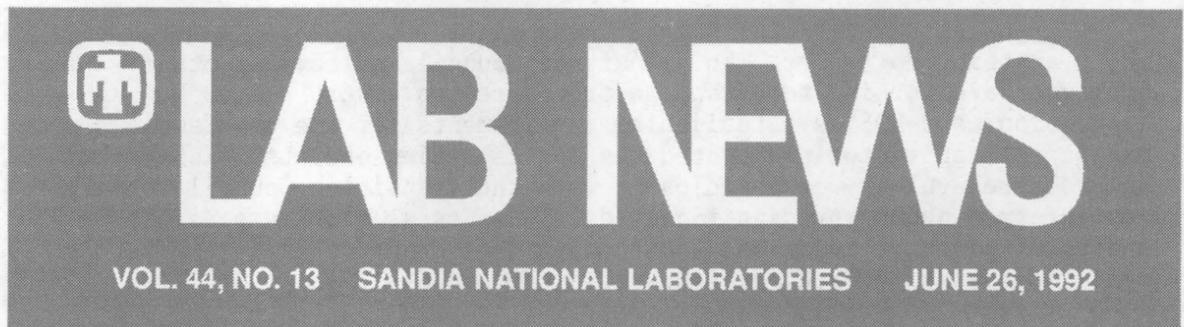
A sensor developed and patented by researchers at Sandia and the University of New Mexico School of Medicine may provide a painless and more informative alternative to the con-

The sensor shines infrared light through a finger to measure glucose levels.

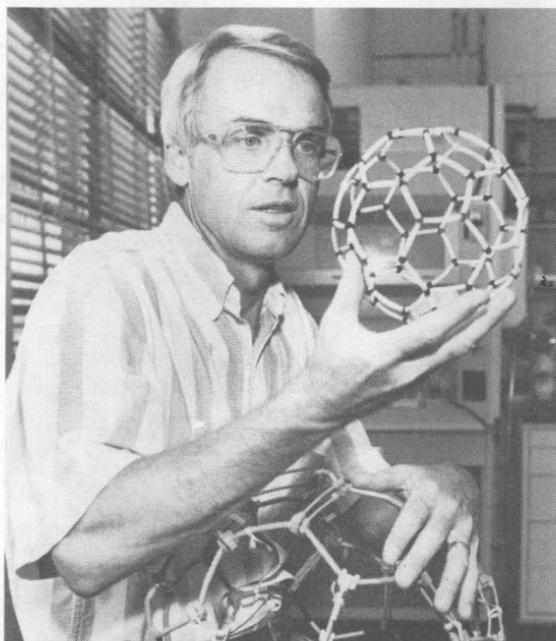
ventional blood-sample method of glucose monitoring. The non-invasive sensor measures blood sugar levels with infrared light that passes through a finger.

The system permits continuous monitoring, not just point-in-time measurements, an important advantage during surgery or childbirth. In addition, the technique used for glucose monitoring might also be made to work for other chemicals in the body, such as alcohol or cholesterol.

Developers of the system are Dave Haaland of Surface/Molecular Spectroscopy and Gas Analysis
(Continued on Page Four)



Buckyballs Look Like Soccer Balls, Behave More Like Soccer Nets



ROGER ASSINK (1812) shows buckyball models. Sandians have found that such molecules can perform as a filter or storage medium for some gases when packed in a lattice arrangement.

Buckyballs may look like molecular-size soccer balls, but Sandia researchers have discovered that crystalline arrays of them perform like the nets at the ends of the soccer field — they catch things. And perhaps even better, they can let some things through and keep others out.

Discovery in 1985 of the pure carbon form excited scientists because of its resilience, usable shape and other qualities. It was found to be one of the most chemically versatile molecules known, with thermal, mechanical, and optical properties scientists thought could be applied to superconducting and other uses.

Roger Assink of Physical Chemistry and Mechanical Properties of Polymers Dept. 1812 and several colleagues have now found that the material has the ability to selectively filter or store gas molecules, depending on their size. It can store oxygen and release it slowly over time, for example, and filter impurities from natural gas.

Technically named buckminsterfullerenes — for the late architect and inventor Buckminster Fuller because they resemble the geodesic domes

(Continued on Page Four)

This & That

No Place Like "Tonopatch" - Extraordinary people with extraordinary capabilities may be the best way to describe Sandia's Tonopah Test Range (TTR) in Nevada, affectionately called "Tonopatch" by some of its employees. Like the rest of the Labs, TTR is rethinking the way it does business today, but it remains one of Sandia's proudest groups. These folks do some of the most demanding, precise weapon tests in the world, and they do it almost routinely. LAB NEWS writer John German and photographer Randy Montoya visited there recently and came back with some interesting Tonopatch stories and photos. Read all about it beginning on page one.

* * *

What Do Sandia VPs Manage? - Well, some of 'em manage to drive me crazy at times, but that's not the answer I'm looking for - it's "divisions" - what we used to call vice presidencies (three VPs also manage sectors). But "division" seems to be slow catching on with many Sandians, probably because it identified a much smaller organization before restructuring. I take some amount of pleasure in saying that it now takes a Sandia vice president to manage what I used to manage.

* * *

We Almost Made It - After surviving the reorganizing and restructuring efforts of the past year or so, I thought the Employee Communications Department had made it through and retained the same name and organization number. Too good to last! We're still the Employee Communications Department, but last week we had our organization number changed from 3162 to 7162 when Glen Cheney took the old 3000 group under his wing. Glen now manages the old 7000 and 3000 groups under the new Internal Programs Div. 7000. An organization change notice will be issued soon listing all the new organization numbers for the old 3000 groups. By the way, now that Glen is my VP, I want to make it plain that he isn't among those VPs who drive me crazy. Plus, I really like his suits, and I hear that his family is an extremely handsome bunch.

* * *

Recycling Org. Numbers - Speaking of organization numbers, the constantly changing numbers continue to cause the Mail Services folks some headaches. If you think that isn't so, consider the following note that was attached to a piece of mail returned several weeks ago to the mail room for rerouting to Org. 6514: "Mail Room: We are Org. 6531. We used to be 6428 before restructure. Before that, we were 6514. Now, in restructuring, the no. 6514 has been reassigned. What used to be 6462 before the restructure is now 6514. This belongs to them." Thanks to Sharon Sargent (6514) and Gladys Shaw (6501) for that gem.

* * *

Transition News - The biggest news right now is that there simply isn't anything to report. The Transition Council and several other employees are working to establish procedures to ensure a smooth transition, and DOE is establishing requirements for the new Sandia management contractor and procedures for selecting one. LAB NEWS writer Howard Kercheval is working closely with the Transition Council to keep you informed about any significant developments as soon as possible. Again, if you have questions about the goings-on or would like to see specific issues covered, give Howard a call on 844-7842.

* * *

Love That Sticker - Bumper sticker spotted recently in Albuquerque: "My son is an honor student at the state reform school." •LP

New ES&H Goals To Guide Sandia Employees & Groups

A set of six environmental, safety, and health (ES&H) goals adopted this month by the Sandia ES&H Council now forms the foundation for corporate and individual ES&H targets and progress.

The corporate goals were developed by a team consisting of Glen Cheney, VP of Internal Programs 7000; Dick Lynch, Director of ES&H Program Management 7200; Joe Stiegler, Director of ES&H 7700; and Lew Newby, Manager of ES&H Assessments Dept. 7001.

"We started by reviewing corporate ES&H commitments, such as the Tiger Team Action Plan," says Lew. "We looked for areas that needed more focus and for areas where there are potential liabilities for Sandia. We also reviewed the achievements of other corporations in meeting their ES&H goals."

The team then developed a draft set of goals that was reviewed, discussed, and commented on by Sandians at all levels.

The Sandia ES&H council, which consists of Sandia's president, vice presidents, and ES&H director, adopted these goals on June 1:

- Meet 100 percent of Tiger Team Action Plan milestones.
- Reduce hazardous waste generation by 50 percent over the period FY93-FY97.
- Reduce OSHA-reportable accidents by 50 percent over the period FY93-97, using FY91 as the base.
- Schedule, complete, and document 100 percent of required management surveillances in FY93 and beyond.
- By Oct. 1, 1993, 100 percent of on-roll employees with service greater than three months will have completed ES&H awareness training.
- Maintain 100 percent compliance with applicable environmental laws and regulations.

For a Safer, More Productive Workforce

"Not all of these goals apply to every Sandian," says Lew, "but as a whole, they will touch each of us. As Larry Humphreys [ES&H Coordinator for Orgs. 1900 and 8700] has pointed out, they're a way of educating and motivating all of us to bring about the cultural change that will lead to a safer and more productive workforce."

The goals are the fundamental element in the ES&H self-assessment program of Sandia line organizations. Each level of management, working with the next lower level, will develop supporting goals for successively lower levels. Eventually all Sandians will have individual ES&H goals. ●

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EXPLAINING NUCLEAR ROCKET TESTING - Jack Walker (6501, left) explains hardware used to test fuel elements for nuclear rocket engines to (from left) General Donald Kutyna, Commander in Chief of US Space Command, responsible for all US space activity; Major Donald Ravenscroft, also of the US Space Command; Gerry Yonas (9000); Orval Jones (20); George Allen (6513); and Colonel Edward Duff of the Air Force Phillips Lab. The presentation was part of a Sandia Space Nuclear Thermal Propulsion facilities tour that included briefings on issues of developing nuclear rocket engines for space and on Sandia FALCON technology involving reactor-driven lasers. (Photograph by Walt Dickenman, 3154)

Hoping Mentorships Will Emerge

Sandia Women's Committee Gives Math/Science Awards To Livermore Area High School Students

The Sandia Women's Committee in Livermore has initiated a new awards program in math and science and has recognized 10 young women in their junior year of high school.

The students were nominated by science and math teachers. Two from each school were then chosen by the principal — one for outstanding achievement in science and mathematics and the other for significant improvement in those fields. Juniors were selected so the award could be listed on college applications.

The winners — accompanied by their math or science teacher, principal, and family members — were recognized last month at a banquet in Pleasanton. Each young woman was hosted by a Sandia employee (see list below), several of whom are members of the Sandia Women's Committee. The awards — a certificate of recognition and a scientific calculator with the Sandia logo — were presented by VP John Crawford (8000).

Selected for Outstanding Achievement in Science and Mathematics were

- Julie Soong, Amador Valley High School, hosted by Jackie Chen (8351).
- Harpreet Pabla, Dublin High School, hosted by Christine Yang (1952).
- Vanessa Lee, Foothill High School, hosted by Jane Ann Lamph (8283).
- Melanie DeGuzman, Granada High School, hosted by Linda Domeier (8711).
- Lorraine Wang, Livermore High School, hosted by Pat Falcone (8111).

The winners for Significant Improvement in



SCIENCE AND MATH achievement award winners with VP John Crawford (8000) are (front, from left) Lindsay Westbrook, Jessica Harmon, Harpreet Pabla, Sandi Wigger, Melanie DeGuzman, (back, from left) Julie Soong, Vanessa Lee, Christine Capitani, Wan-Sze Ho, and Lorraine Wang.

Science and Mathematics were

- Wan-Sze Ho, Amador Valley High School, hosted by Jill Hruba (8713).
- Jessica Harmon, Dublin High School, hosted by Glenda Gentry (8011).
- Christine Capitani, Foothill High School, hosted by Trish Larson (8453).
- Sandi Wigger, Granada High School, hosted by Cynthia Richards (8535).
- Lindsey Westbrook, Livermore High School, hosted by Sandra Lormand (8523).

Celeste Rohlfling, a chemist in Theoretical Dept. 8341, spoke to the young women about "Challenging Yourself." Stressing the importance of college, she said their goal should be to achieve

the finest education they and their families could afford. She pointed out that statistics do not paint an attractive future for women.

"Half of women who marry will divorce," she reported. "One quarter raise their children without a father. A significant number of single mothers end up living in poverty. The foremost way to avoid this grim situation is to get a good education."

Math, Science Boost Job Prospects

After describing various careers available in math and science, Celeste said that taking math and science courses, even if a student isn't planning a career in those fields, can give an advantage in the workplace.

Admitting that being a chemist, a wife, and a mother could sometimes be exhausting, Celeste said that achieving a fulfilling balance among these roles is also an exciting challenge.

"Corporate America is aware that the work force of the future is diverse, and consequently companies have to become 'family friendly' to recruit the best talent," she told the audience. "There will be more and more options to make life easier for working parents when these young women enter the labor force."

Besides being recognized for their achievements, the students were able to talk with Sandia women and hear firsthand about technical careers and job opportunities in math and science. Many of the Sandians gave their business cards and phone numbers to the young women, to help foster role model or mentor relationships by encouraging the students to call for guidance or advice.

Committee Grew from QAT

The Sandia Women's Committee was formed in March as an offshoot of the DOE Annual Review of Lab Programs for Women, which Sandia co-hosted with Lawrence Livermore National Lab. A Quality Action Team was formed to ensure the implementation of any action items resulting from the DOE Review, and the team's 11 members became the core of the Sandia Women's Committee.

Along with outreach programs such as the Science/Math Awards, the Committee is sponsoring an "in-reach" program, a series of brown-bag seminars concerning work and family issues that will take place this summer. In addition, the Sandia Women's Committee will coordinate the publishing of the proceedings from the DOE Review and is sponsoring a new Expanding Your Horizons program for the Central Valley. This all-day seminar for young women interested in careers in math and science is oversubscribed in the San Ramon and Amador-Livermore valleys.

The Sandia Women's Committee is open to everyone on site. Meetings are held the first Wednesday of each month from 2 to 3:30 p.m. More information is available from Sandia Women's Committee Chair Victoria Levin (8641).

SANDIA WOMEN'S COMMITTEE members who organized the awards banquet include (front, from left) Pat Falcone (8111), Glenda Gentry (8011), Mary Rivenbark (8534), (back, from left) Trish Larson (8453), featured speaker Celeste Rohlfling (8341), Linda Houston (8526), Victoria Levin (8641), Sandra Bowers (8615), VP John Crawford (8000), and Cynthia Richards (8535).



SANDIA LIVERMORE NEWS

Welcome

California: Hayward — Gus Allen (8526); Stockton — Nicole Coleman (5363), Pamm Lesley (8531); Livermore — Sharon Harrison (8445); Oakdale — Patty Loosli (8116); Tracy — Bobbie Vital (8114).

Take Note

David Shimizu (8272) was part of a team at San Joaquin Delta College that placed 11th nationally in Human Powered Vehicle competition recently. The national contest was hosted by Delta and neighboring University of the Pacific in Stockton. David did eight detailed drawings on parts for the Delta HPV entry using the Autocad computer-aided drafting program. The team competed against two- and four-year colleges and universities across the US.

Recent Retirees



Hazel Willyard
8275



Mike Stephenson
5366 27



(Continued from Page One)

Glucose Monitor

Dept. 1823; Dr. Philip Eaton, Director of UNM's General Clinical Research Center and Chief of Endocrinology at the UNM School of Medicine; and Dr. Ries Robinson, a UNM School of Medicine resident and Sandia post-doctoral fellow. Funding for the project came from Sandia's Technology Maturation Program and the National Institutes of Health, which supports the General Clinical Research Center.

Results of work on the monitor were scheduled to be presented at the national American Diabetes Association meeting in San Antonio earlier this week. The team's findings are to be published this fall in the journal *Clinical Chemistry*.

Could Help Reduce Complications

Robinson is the first UNM School of Medicine resident to receive part of his training as a member of a Sandia research team. He has been a part-time Sandia post-doc for the past year, as well as a part-time resident at the medical school. Before that, he worked on his own time to develop the monitor with Dave and former Sandian Ken Ward.

"The enormous costs and life-threatening complications that can result from diabetes," Robinson says, "and the daily discomfort involved in its care and treatment, make this technology a

tremendous boon for diabetics."

By providing an accurate, painless method for measuring glucose, the technology could greatly improve diabetics' quality of life and possibly reduce the incidence of complications of the disease, such as blindness, kidney disease, amputations, and increased risk for heart disease and stroke. Diabetes is the leading cause of blindness in people aged 25 to 74 and results in 12,000 people losing their sight each year.

The disease is also a major contributor to health care costs, estimated at \$20 billion annually for both care and treatment.

The technology is based on infrared spectroscopy and advanced statistical techniques used to process spectral data. The sensor uses near-infrared light, which has slightly longer wavelengths than visible light and can penetrate tissue, providing a "window" into the body.

When infrared light is shone through a finger inserted into the monitor, a portion of the light at each of various wavelengths is absorbed by the components in the tissue and blood, including glucose. After passing through the finger, the light is dispersed into a spectrum and the spectral data is analyzed for glucose-specific absorptions to determine glucose concentrations.

The Sandia/UNM sensor differs from other non-invasive technologies under development in both the method of finger sampling and the sophistication of the algorithm (a procedure for solving a mathematical problem) used for analysis of

the spectral data. Differences between patients in skin pigmentation, blood chemistry, and finger thickness require these sophisticated techniques to accurately measure blood glucose.

The technology combines modified, commercially available spectroscopic equipment with chemometric data analysis originally developed at Sandia for analyzing aging nuclear weapons. A

Combining a monitor with an insulin pump could essentially create an artificial pancreas.

relatively new branch of analytical chemistry, chemometrics uses a mixture of mathematical and statistical tools that allow chemists to analyze vast quantities of data and extract useful information to a degree that was previously impossible.

"Unlike more conventional technologies," says Dave, "this is able to simultaneously analyze the entire spectral region containing a multitude of data points, which translates into greater precision, sensitivity, and reliability in the sensor."

During the past 10 years, Sandia has been a leader in applying chemometric tools such as multivariate statistical methods to the analysis of spectral data.

Could Pair with Insulin Pump

Though the technology is still in its developmental stages, the goal is to develop a home monitor and a monitor that could be worn and coupled with a programmable insulin pump. The combination pump and monitor would essentially create an artificial pancreas, eliminating the need for insulin injections by automatically delivering measured doses of insulin to the patient on the basis of blood glucose levels.

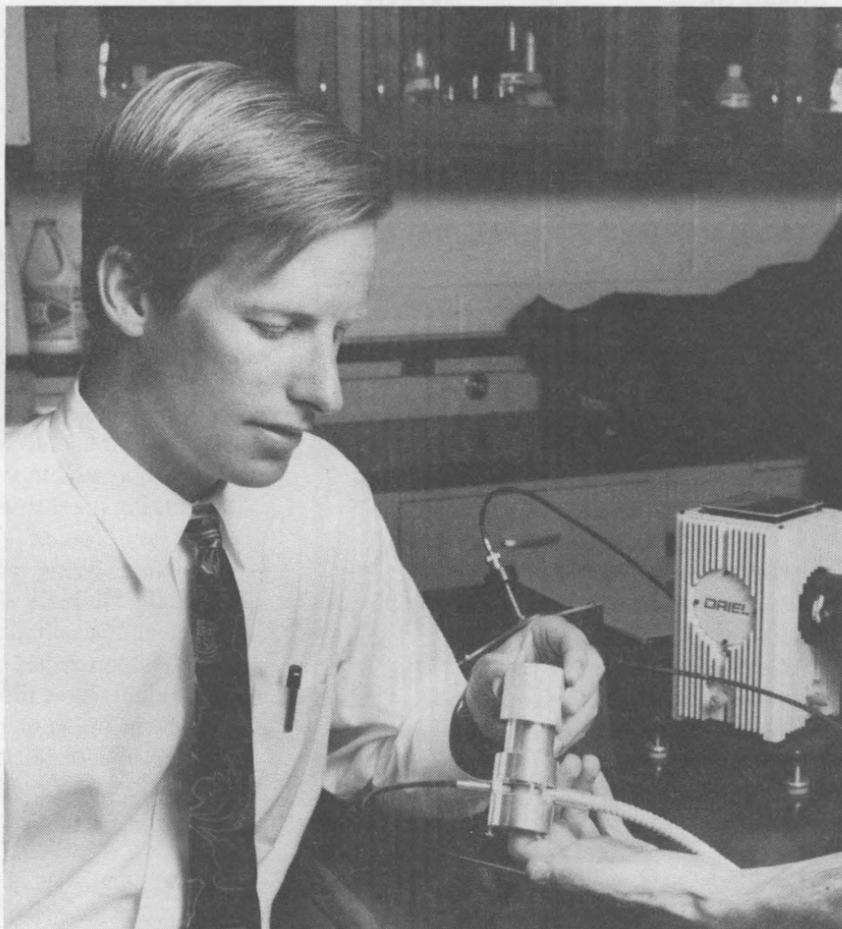
An implantable, miniaturized insulin pump was developed in the 1970s by a Sandia/UNM team and transferred to industry. The pump is being tested in about 700 patients around the world.

This work launched an ongoing collaborative effort between Sandia and the UNM School of Medicine in biomedical engineering, allowing researchers to draw on the unique technical expertise and facilities of each institution. For example, testing of the glucose monitor on human subjects is being conducted in the medical school's General Clinical Research Center, one of 73 human investigation laboratories around the country that is funded by the National Institutes of Health.

"This work was made possible by the combined resources and expertise of both institutions, a collaboration that we expect to continue," says Eaton.

Now that the feasibility of the glucose-monitoring technology has been demonstrated, Sandia and UNM are looking for an industry partner for further development toward a commercial monitor. ●JClausen(7161)

LIGHT TOUCH — Dr. Ries Robinson, a Sandia post-doctoral fellow and UNM School of Medicine resident, demonstrates a non-invasive sensor developed by Sandia and UNM to monitor blood sugar levels in diabetics. The infrared light sensor may end the need for diabetics to prick their fingers daily to draw blood samples used in tracking blood sugar levels.

*(Continued from Page One)*

Buckyballs

he designed — buckyballs are composed of 60 or 70 (more commonly 60) carbon atoms arranged in the form of a hollow sphere. They are the third major form of pure carbon, the others being diamond and graphite.

'Empty' Sites Not Empty

The linking of buckyball molecules into a crystalline form leaves six octahedral voids per molecule. The latest surprise is that these "empty" sites — in the form of two pyramids, joined at their bases, their peaks at opposite poles — are not exactly empty.

While performing a routine spectroscopic analysis of material meant to be polymer ingredients, Roger found about one percent of the voids contained oxygen molecules.

Subsequent work by Roger, Doug Loy (also 1812), Jim Schirber (Research Scientist for Solid

"If what we've learned in this short period is representative, we have found an extraordinarily versatile tool."

State Science 1090), Bruno Morosin (Advanced Materials Physics Dept. 1153), and Gary Carlson (Fuels Science Dept. 6211) showed that the oxygen molecules he found tucked into the voids of his sample were not anomalies.

"We found a couple of interesting things," Gary says. "First, it takes special precautions to prepare fullerenes without at least fractional amounts of residual gas molecules.

"The second thing we found was that increasing pressure forces more gas into the voids. When we pressurized oxygen, for example, we found that more than 50 percent of the interstitial spaces

stored oxygen."

After the oxygen has been inserted into the buckyballs under pressure, Roger says, it is released slowly. "If you put in a lot of oxygen, even after 25 days approximately half of the oxygen is left."

Effective Gas Filter

Members of the research group believe that by choosing suitable fullerenes, modifying their crystal structure, or chemically altering their surfaces, they might be useful in the controlled release of gas over time.

Another interesting facet of their discovery is that while smaller molecules such as oxygen, hydrogen, and nitrogen readily pass through the spaces between buckyballs, larger molecules, such as methane, do not fit through them.

Considering that, says Roger, "we have something that can be used not only to store gas, but *(Continued on Next Page)*

Sandia News Briefs

Sandians Involved in Historic Weapons Accord Work

Sandia researchers will be providing a variety of technical assistance in support of the dismantlement assistance accord signed last week by President Bush and Russian President Boris Yeltsin. Sandia is the lead agency for the design and delivery of protective containers for nuclear materials and 2,500 protective blankets for weapons components that have been ordered by the Russian Republic, says David Nokes (5801), who is coordinating much of Sandia's effort. Sandia also will play key roles in several other areas of expected assistance, including developing a suite of accident-response equipment in cooperation with Los Alamos and Lawrence Livermore national labs, modifying Russian rail cars with safety and security improvements, assisting the Army Corps of Engineers with the design of underground storage facilities for material left over from dismantled weapons, and developing a system for material control and accountability (that would cover material for nuclear power plants as well as weapons).

Four High School SuperQuest Teams to Study at Sandia

Four winning teams from a national high school computer competition, including one from Albuquerque's Del Norte High School, will spend July 6 through 24 at Sandia, studying supercomputers and their applications in research. Dick Allen, Manager of Applied and Numerical Mathematics Dept. 1422, says the four teams are among 20 winners in the fifth national SuperQuest competition. Each winning school will receive a Digital Equipment Corporation (DEC) 5000 system that will link the school to supercomputing research facilities. Teams from Del Norte; Bountiful High School, Bountiful, Utah; Evanston Township High School, Evanston, Ill.; and Louisiana School for Math, Science, and the Arts, Natchitoches, La., will attend daytime classes at Sandia and work in UNM computer labs in the evenings. Sandia is the only DOE lab designated a regional SuperQuest Center. The other four centers are at Cornell University, the University of Illinois, the University of Alabama at Huntsville, and Reed College/Oregon Graduate Institute. Albuquerque's Highland High School team will go to Cornell for the summer program.

Newman Helping Redirect Russian Scientists' Work

Sandia technical analyst Patricia Newman (5028), a fluent speaker of Russian and other languages, is leaving this weekend to help set up a center to rechannel Russian weapons scientists into peacetime work. Called the International Science and Technology Center, the facility is being funded with \$25 million each from the US, Japan, and the European Economic Community. Pat will be one of five Americans on the Preparatory Committee, joining others from the National Academy of Sciences, Lawrence Livermore National Laboratory, and the Departments of Defense and State. "The purpose of the center is to serve as a clearinghouse for projects that will channel the talents and knowledge of weapon scientists and engineers to peaceful activities," says Pat. Congress agreed in March to support the facility as a means of co-opting scientists and engineers who might consider defecting to rogue states.

Sandia Researchers Kadlec and Kargel Win DOE Quality Award

Two Sandia instrumentation researchers have received DOE/AL's Quality Improvement Award for their work in developing a self-test system. Emil Kadlec of Instrumentation Development Dept. 2663 and Mark Kargel of Instrumentation Engineering and Technology Dept. 2665 were cited for contributions to "improved product quality and attendant cost reductions through the design and development of the Built-in-Self-Test (BIST) System for the MC4130." The MC4130 is the telemetry package for the B61 Common weapon program.

Renken Elected to Post in Radiation Protection Group

Jim Renken (9352) has been elected Secretary of the American Nuclear Society's 1,800-member Radiation Protection and Shielding Division. His term began this month and will continue through May 1993. Jim is now serving the last year of a three-year term as a member of the Executive Committee, which includes the division's officers along with people representing groups such as national labs, universities, and industry.

Send potential Sandia News Briefs to LAB NEWS, Dept. 7162.

(Continued from Preceding Page)

Buckyballs

something that also is a very effective filter."

For example, he says, the most usable constituent of natural gas is methane. By exposing natural gas to a buckyball filter, impurities such as nitrogen could be separated out, leaving behind a purer fuel.

A hurdle remains, however, before fullerene filters become practical: A way must be found to array buckyballs in bulk and shape. Despite their demonstrated utility, their structure is mechanically weak, and they would have to be deposited on a supporting framework before they could be applied as filters. Roger and Doug also are at work in that area and in others focused on developing uses for buckyballs.

First Buckyball Polymer

They announced at a meeting of the Materials Research Society a few months ago, and reported in a recent issue of the *Journal of the American Chemical Society*, that they have synthesized the first buckyball polymer.

The polymer, a network of buckyballs linked by hydrocarbon bridges, represents another step in understanding and manipulating the versatile material.

The success of this work, they say, demonstrates the potential of using fullerenes to create materials that could improve the performance of catalysts — materials used to speed up chemical reactions — or act as catalysts themselves.

Many aerospace applications, such as seals and cables, need polymers capable of withstanding high temperatures, and the polymer Doug and Roger synthesized appears to fill that requirement. Fullerenes were combined with xylylene monomers created by heating paracyclophane, then added to cooled toluene to create a copolymer that, when heated, begins to slowly lose mass at 380 degrees C, but retains two-thirds of its mass even at 1000 degrees C.

This work and the discovery that buckyballs can filter and store gas molecules are both just recent examples of the expansion of potential for the material, Roger says.

"We've known about fullerenes for less than a decade, and we still have a lot to learn about them," he says. "But if what we've learned in this short period is representative, we have found an extraordinarily versatile tool." ●

Sympathy

To Revel Rainey (7811) on the death of his father in Albuquerque, May 21.

DOE Calls On Sandia

National Center to Help Commercialize Labs Manufacturing Technologies

In an effort to open up the Labs' diverse range of manufacturing capabilities and technologies to industry and to strengthen internal programs, Sandia will become a national Center for Advanced Manufacturing Technology.

A formal announcement about the new Center was scheduled to be made by DOE Secretary James Watkins at a National Technical Initiative (NTI) conference in Kansas City yesterday, June 25. NTI is a series of regional conferences sponsored by DOE and various other executive-branch federal agencies. The meetings bring together business leaders, academics, and government agencies to discuss opportunities for commercializing taxpayer-funded technologies.

The national Center will allow private industry to benefit from the Labs' technical resources to solve common problems in manufacturing. The Center will draw on Labs-developed technologies areas such as advanced materials and processes, precision casting and machining, microelectronics, intelligent machines for hazardous and flexible operations, computer-aided manufacturing and design, integrated information systems, environmentally conscious manufacturing, and quality and reliability technologies.

Reduced Costs & Increased Effectiveness

The end result, says Bill Alzheimer, Director of the new Advanced Manufacturing Technology Center 2900, should be reduced manufacturing costs and increased effectiveness for US industry and for DOE.

"This Center will interact with all three Sandia sectors and with US industries across the board," he says. "The Center will provide a means to focus Sandia's diverse manufacturing activities." In the past, notes Bill, Sandia has interacted extensively with US industry in defense, energy and reimbursable programs. More recently, the Labs has been providing support to industry through cooperative research and development agreements and programs such as the Technology-Based Regional Economic Development program. ●

Card of Thanks

Since the spring of '91 I have been battling breast cancer, which has included surgery, chemotherapy, and radiation. Additionally, I am dealing with metastasis to the brain and spinal fluid, and my daughter's recovery from a broken pelvis and other internal injuries related to a motorcycle accident.

Among the problems resulting from the metastasis, I have experienced physical imbalance and hearing loss. You might well imagine the limitations my health problems have caused, as well as seriously restricting my activities.

The people I work with saw I was sinking and came to my aid. As people around the Labs began to hear of my dilemma, I began receiving unbelievable help from those I know and those I don't know: cards and prayers, meals, an SLFCU account for donations, housecleaning, transportation, and moral support.

Even though I do not know each of you by name, you have made a difference. Thank you for making each day I'm alive more enjoyable.

Barbara Ortiz (7142)



(Continued from Page One)

TTR: One of a Kind

Nellis are Yucca Mountain and the Nevada Test Site.

Tests are normally performed during "prime time," which falls about 30 minutes after sunrise during the summer months, before heat waves from the desert floor begin to interfere with the range's optical equipment. During winter, prime time falls 30 minutes before sundown, allowing range equipment to warm up all day. TTR employees often leave home at 2 or 3 a.m. during the warmer months, says Joe.

The work at TTR is as diverse as the hours, says TTR Range Manager Ron Bentley (2719). "Our main job is to test weapon delivery systems,"

TTR employees often leave home at 2 or 3 a.m. during the warmer months.

he explains. "We make sure that the arrow leaves the bow, that it flies straight, that it sticks to its target, and that it detonates like it's supposed to."

This means taking and analyzing data, lots of it, including telemetry and optical data from various aircraft, weapons, and targets. "Our product is data,"

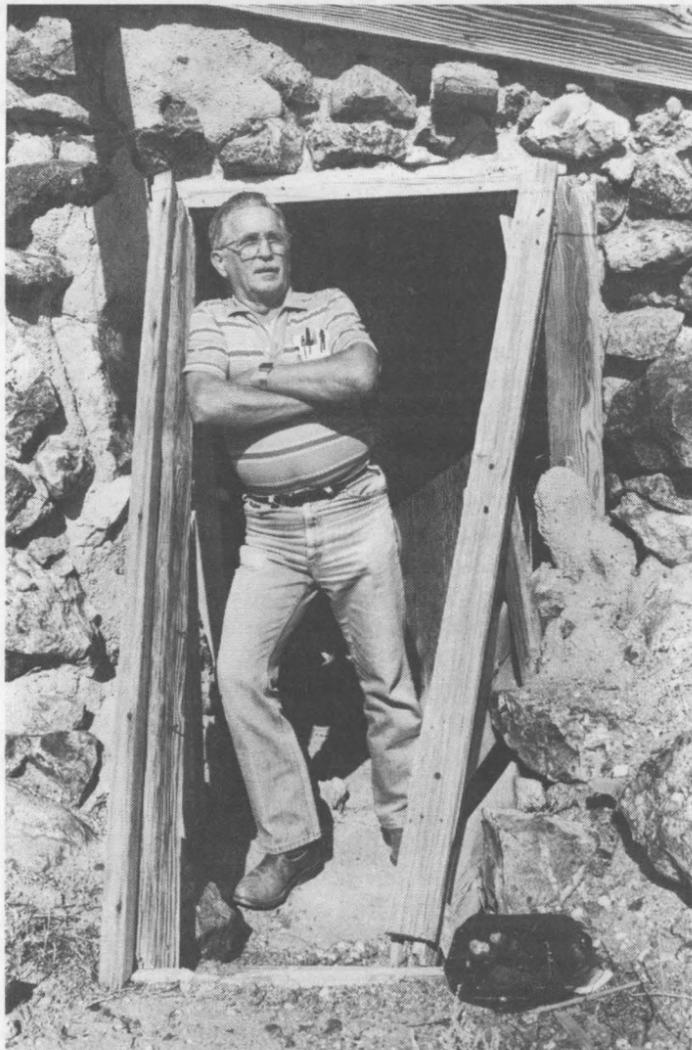
(Continued on Page Ten)

Previous Occupants Were Silver Miners

Tonopah 'Old Timer' Recalls Range's 35-Year History

Tonopah Test Range has accomplished a lot of firsts in US military history, and as the only current employee who saw TTR open its doors to full-time testing back in 1957, Lloyd Young (2712) has witnessed them all.

Until WWII, the range had only been occupied by homesteaders and silver and gold miners, who had occupied the area for decades. In 1942, the Army Air Corps turned the area into a training



HISTORY MADE HERE — Standing in the doorway of an abandoned silver miner's homestead, TTR "old timer" Lloyd Young (2712) says he's witnessed a lot of US military history. Lloyd's been at the range since 1957.

Tonopah People Are Worth Millions

One of the greatest challenges Tonopah faces is maintaining its unique technical resources in times when DOE and DoD programs are shrinking and realigning, says Ron Bentley (2719), TTR Range Manager.

But Tonopah's unique resources are not its radars, optical tracking devices, or high-speed camera equipment. What's truly unique about Tonopah is its experience base.

"The people here are Tonopah's greatest asset," says Ron. "Their level of experience [nearly 15 years experience each at the range] is an intangible metric that doesn't show up on paper. Each of these people is worth a million dollars in testing equipment."

Can't Buy This Kind of Experience

That experience level plays a big role in meeting customer needs, says Ron. "If there's any portion of the Labs that needs to operate as a team, it is Tonopah," he says. "During a test, every individual must come together as a functioning whole to support a customer's data requirements."

Meeting these needs involves knowing more than just your own job, he says. Each per-

son at Tonopah is knowledgeable in what he or she does and what others around them do. In other words, TTR folks wear a lot of hats. During tests, says Ron, motorpool employees, computer programmers, draftspeople, and mechanical designers alike help operate tracking equipment, and several trained employees take turns being flight attendants on the Ross flight to and from Las Vegas.

"One of the things I hear a lot from outside customers is that if you gather eight of our people in a room for a discussion about testing requirements, that group knows not only what their own equipment can and can't do, but also what's involved in accommodating the customer's overall testing needs. Then each can do modifications on their equipment to support those needs. For instance, if you've got to modify a piece of software to accommodate a test, the person who wrote the software is probably sitting right there.

"Because of this level of experience, it's easy for us to make a firm commitment to a customer," he says. "You just can't buy that kind of experience anywhere."

ground for P-39 and B-24 bomber pilots. Two years later, nearing the end of WWII, the Air Corps pulled out.

Lloyd first came to the test range as one of three caretakers in 1957. At the time, the range conducted only sporadic testing, so Lloyd spent a lot of time learning the lay of the land, locating abandoned silver mines and old homesteads, and exploring TTR's string of dry lake beds.

Because no experienced air traffic controllers were available in those days, Lloyd was trained to play that role. To this day he monitors air traffic during tests and guides pilots by radio to and from their Tonopah targets.

"In those days, there were no how-to books to tell us how to test," says Lloyd. "We taught ourselves. There was also less supervision. Everybody knew how to do their jobs and did them well. Tonopah was empowered before it was fashionable."

In the early days, he says, most tests involved dropping a weapon and then watching it. If it worked, the test was a success. If not, it was back to the drawing board. High-tech measurement and data-gathering equipment didn't come along until later. Nowadays, data is the most important product of a test. Optical tracking equipment, radars, and high-speed cameras do the watching, and much of the data is gathered from telemetry systems onboard aircraft and weapons and then analyzed in TTR computer systems.

A Lot of Firsts

Lloyd says early work at the range included assisting NASA in gathering data on the missile-like X-15, the first manned outerspace aircraft. The X-15, launched from a B-52, had skids where rear wheels should be so it could land on dry lake beds. Lloyd says the X-15 landed five or six times on Mud Lake, one of several lake beds near the range.

Another project involved develop-

ing and flight testing the U-2, a spy plane that could fly at an altitude of 68,000 feet. During the development of the U-2's weapon-delivery capability, Lloyd guided US pilot Francis Gary Powers through several flight tests. Powers was later shot down over the Soviet Union, an event that attracted international attention.

In a project code-named COIN during the Vietnam era (for "counter-intrusion"), Tonopah helped develop ground-penetrating sensors for detecting truck and artillery movement. When these devices hit ground, their sensor-containing noses were embedded while their antennas stayed above ground. Because these antennas looked like jungle foliage, the sensors were nearly invisible. Lloyd estimates that at least 10,000 of the sensors were dropped on Vietnam between 1968 and 1971. (Several Sandia, Albuquerque organizations helped develop the sensor.)

Secret of Success

In addition, says Lloyd, he has witnessed the development of advanced parachute systems for lay-down bombs and containers for shipping explosives. More recently, he has seen the development of cruise missiles such as the Tomahawk and testing of new fuel-air explosives, not to mention the nearby development of the F-117 Stealth fighters.

Another recent but memorable project was the development of the bunker buster ground-penetrating weapon used during the Persian Gulf war. Lloyd says just three hours after he guided two F-111 pilots through a successful drop test at Tonopah, the pilots were on their way to the Persian Gulf to use the real bunker busters on Iraqi military targets.

Lloyd says the secret of success over the years at TTR has been a sense of teamwork among the devoted and seasoned personnel. "As experienced people retire and as testing becomes less frequent," he says, "it'll be difficult to train new people. The people here are what make this place unique." (See "Tonopah People Are Worth Millions" above.)

"This is a place that has contributed in many ways to our nation's defense," he adds. "I'm proud to be a part of the weapon history made here. I hope that tradition continues." ●JG

Uncertainty Reigns**Successful Test Range Faces a Tougher Tomorrow**

Over the years, TTR has made many significant contributions to US national security. But the meaning of national security is changing rapidly, and DOE's mission is changing along with it.

Such changes bring a lot of uncertainty to a place like Tonopah, which has existed for more than 35 years with the express purpose of testing US weapon systems. That's why TTR folks lately have been spending time finding ways to apply the range's testing and data-gathering capabilities to an evolving set of customer and national needs.

"We have to go out and earn our keep," says TTR Range Manager Ron Bentley (2719). "We must identify what our future role will be, both within DOE and with external customers. And we need to decide how TTR can remain a national asset and contribute to the future challenges of this nation."

Ranges Have Competencies Too

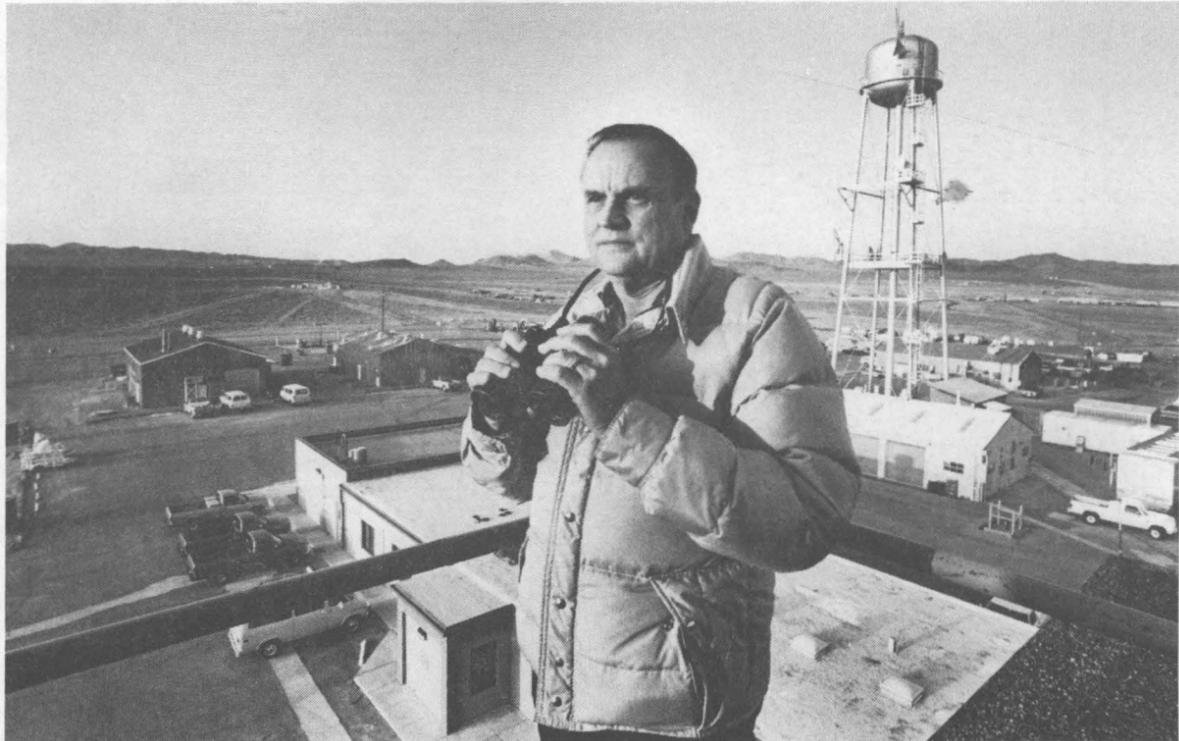
In the short term, says Ron, the key to adapting to this changing environment is to keep costs down while maintaining the range's testing resources. The long-term goal, he says, is to identify the unique set of testing capabilities, or its "core competencies," that make TTR a valuable national resource and differentiate it from other national test ranges. By clearly defining these capabilities, he says, TTR employees will be able to identify how the range can contribute in a unique way to the changing needs of a variety of customers.

Ron says one of the range's core competencies is its ability to mobilize quickly and with little notice, an advantage enjoyed only at smaller ranges such as Tonopah. In addition, he says, TTR's work over the years developing parachute

"Simulation is becoming a big part of weapon development, any activity in the defense arena."

systems for weapon systems has required the range to develop a very accurate trajectory measurement capability. This sets TTR apart from many other ranges.

TTR's geographical layout also means the range can accommodate low-level flight tests from either north- or south-bound directions and take advantage of morning and evening lighting characteristics that make for precise trajectory measurements. And TTR's employees also have ample opportunities to practice, thanks to frequent fly-bys by Nellis AFB. But TTR's greatest



EYE TO THE FUTURE — Although TTR has existed for 35 years supporting primarily DOE and DoD programs, Range Manager Ron Bentley (2719) envisions a different future for the range that includes an evolving set of national needs and an expanded customer base.

asset by far is its people, says Ron, who average 15 years' experience at the range. (See "Tonopah People Are Worth Millions" on page six.)

Signs of the Times

As for the future, says Ron, much of TTR's work is expected to be in the arena of rapid prototype development. DoD is revamping its weapon development process to account for tighter budgets. Now, once a prototype weapon proves successful, the weapon design may be "shelved" until needed. This cost-saving strategy will allow DoD to develop advanced weaponry without incurring the costs of large-scale weapon manufacturing.

"Tonopah will continue to support these rapid prototype programs," says Ron. "Rapid prototyping is going to continue to be a big issue with DoD and other customers."

In addition, he says, current trends indicate that a lot more weapon testing will be performed in order to validate computer models. Models are now under development that can simulate warfare scenarios precisely and help weapon engineers make important design and development decisions.

"Simulation is becoming a big part of weapon development, any activity in the defense arena," he says. "What's now needed is a facility that can

validate these computer simulations so that fewer costly tests are required."

A new initiative under development in Sandia's Work-for-Others Sector — called the Reconnaissance, Surveillance, Target Acquisition, and Kill Assessment (RSTAKA) program — may make TTR a national center for validating complex computer models that simulate the info-rich modern battlefield.

"The defense industry is beginning to look at how simulation, precision-strike weapons, sensors, and information fit in the overall battlefield scenario," says Sam Varnado, Director of WFO Sector Development and Support Center 9900. "RSTAKA may provide an opportunity for Tonopah to apply its testing expertise to fulfill a major national need." (More on RSTAKA in future LAB NEWS issues.)

Another current emphasis at TTR is the ES&H initiative. "Let's face it, the world is more concerned about environmental issues than it used to be, and rightly so," says Ron. "Safety, operational safety, explosives safety are all part of the culture here because we deal with them on a daily basis. But it is important that we watch these issues very carefully as we prepare for the future." ●JG

Air Force Thanks TTR People for Keeping Secret

Until late 1988, when the Air Force's new F-117 Stealth fighter was publicly unveiled, TTR employees were instructed to stay silent about their reclusive neighbors working around the clock just a few hundred yards to the west.

The nearby Air Force facility, consisting of more than 50 hangars and several administrative buildings, was constructed in the early '80s to serve as a training and testing facility for F-117 fighter pilots. For several years, the Stealths took off from and landed on the same airstrip used by TTR folks to get to and from work. The Air Force was so protective of its secret that most TTR employees had never laid eyes on the bat-like fighter jets until the unveiling. The fighters were kept under hangars by day and flown from the TTR airstrip only at night.

Although TTR folks were naturally curious about the work being conducted next door, they

did a marvelous job of keeping the Air Force's secret, says Dan Finnegan, Manager of Administrative Support Dept. 2716. As soon as security restrictions about the fighters were lifted, the Air Force base commander at the time sent TTR employees a letter of appreciation, scribed on a 20 by 20-inch color photo of an F-117 in flight. The photo is displayed on a wall in the Range's lunchroom.

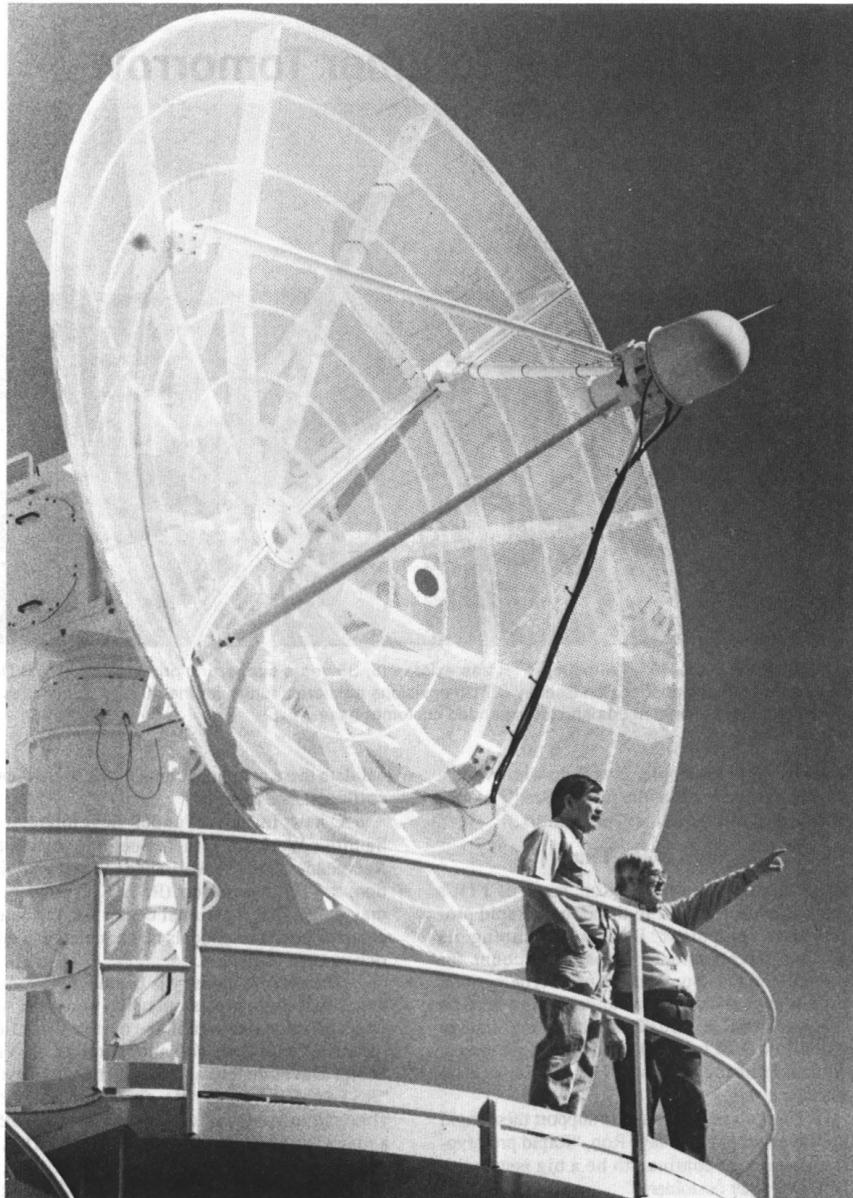
Employees Rightfully Proud

The ability of TTR employees to keep secrets stems from the security-conscious culture required at Tonopah, says Dan. "Our testing customers need to know that this is a tight group that keeps its mouth shut," he says. "Although there was a lot of speculation by the media and others about what the Air Force was doing out here, our people would just say 'I don't know.' Employees

here are rightfully proud of their cautiousness and the respect they've earned from the Air Force."

Dan says the range enjoyed several advantages to having the Air Force facility nearby. "The Air Force added modern navigation equipment, lighting systems, and a new air control tower to our airstrip, which improved our commuting safety considerably," he says. "They also helped with security forces, and we sometimes used the nearby dormitory and mess hall when we needed to stay overnight to prepare for a test."

Unfortunately, he says, the Stealth fleet and its support crew are moving now that security requirements have relaxed. They will soon be housed in new hangars at Holloman Air Force Base in southeastern New Mexico. "The Air Force has been a wonderful neighbor and kindred spirit to us," says Range Manager Ron Bentley (2719). "It'll be sad to see them go."



TEST DIRECTOR Bob Sherwood (2713, left) and Henry Stuckert (2711) scan the horizon from atop the large telemetry tracking antenna located at the TTR command post.

Tonopah Test Range . . .

525 square miles of the Nevada desert that is much more than a collection of buildings, antennas, and tracking stations. In its 35-year history, Tonopah has conducted historic tests on such weapons as the bunker buster ground penetrator and the Tomahawk cruise missile. Aircraft such as the U-2 spy plane have also been put through their paces here, along with various other US hardware. But Tonopah's uniqueness comes from its people, hardy Sandians with a dual sense of pride and teamwork that is Tonopah's essence.

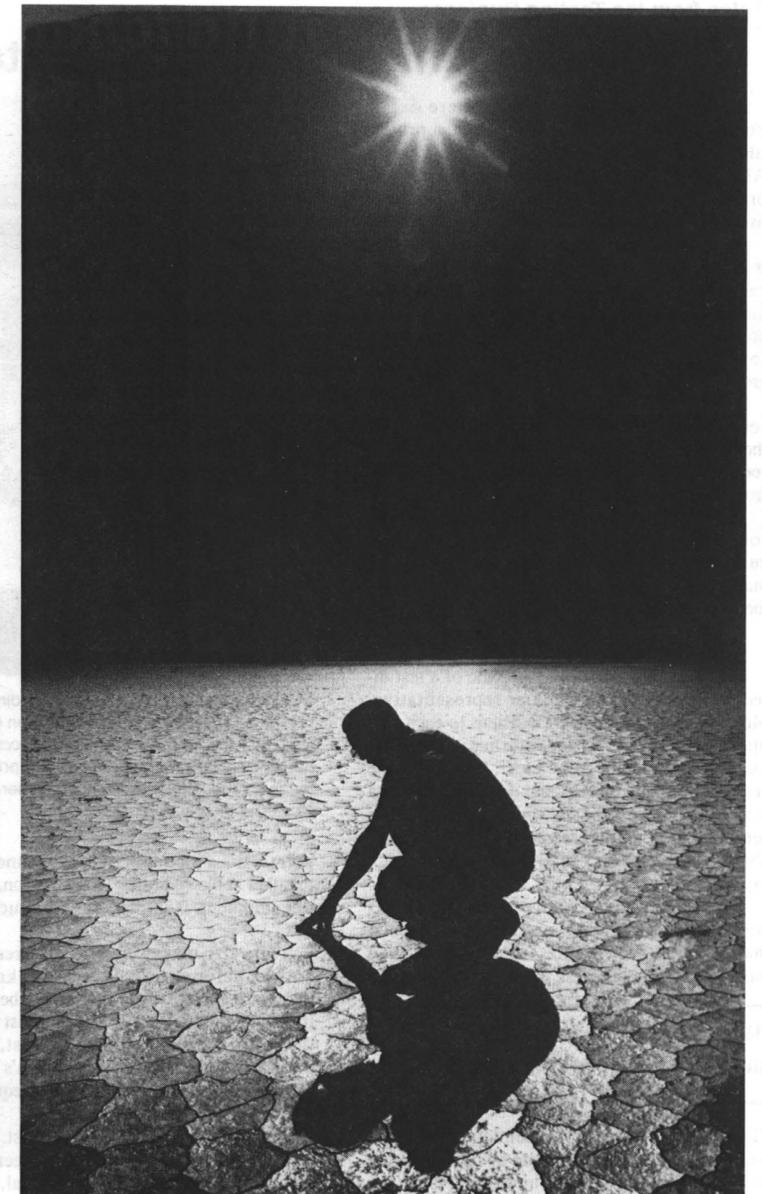
(Photography by Randy Montoya)



PHOTOS OF FAST THINGS — Marty Konkel (2712, left) climbs into the viewing seat of one of the range's optical trackers while Rob Smith (2712) reloads its film cartridge.



RANGE NERVE CENTER — Test directors Joe Dykes (top) and Jim Enlow (both 2713) often "run the show" from TTR's main control room, the nerve center of the test range. The nerve endings are the range's various radar, high-speed camera, and telemetry stations.



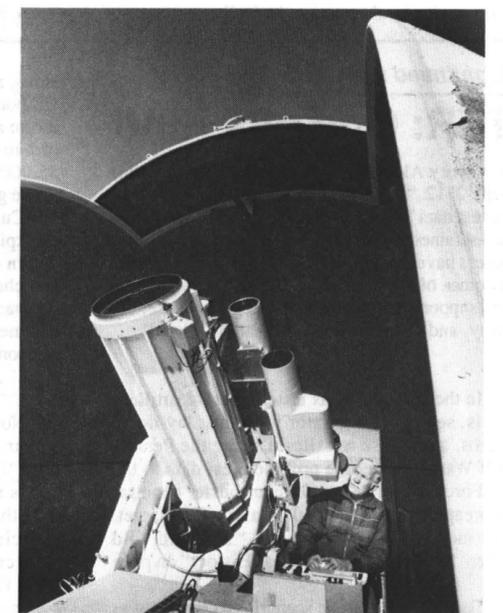
FLAT, HARD SURFACES make Tonopah's dry lake beds ideal launching and landing pads for aircraft tests. They are also used as surfaces for targets.



DUANE SMITH (2713, left) and Roy Johnston (2716) study a B83 after a routine stockpile surveillance test.



HERDS OF WILD HORSES roam freely on the test range. Depending on the availability of water and food, their numbers fluctuate from year to year, say TTR folks, who try not to interfere with the natural order.



LANCE WILSON (now retired) peers out from behind a tracking telescope housed under a rotating dome.

Tales from the Testing Business

Few Moments of Gathering Data Only Part of the Job

Three, Two, One . . . Somewhere out on Tonopah Test Range, a missile fires, a projectile is launched, or a weapon "scores" its target. Although the actual test event lasted only seconds, TTR folks probably gathered reams of useful data.

What most people don't think about, however, is the amount of preparation required before a successful test can take place. Weeks, sometimes months, are spent meeting with range customers, providing cost estimates, and getting approvals before an aircraft or weapon ever gets off the ground.

Tonopah's three test directors — Jim Enlow, Joe Dykes, and Bob Sherwood (all 2713) — are the focal points for getting this job done. "Test directors are responsible for the success of a test from beginning to end," says Joe.

"We're responsible for matching range resources — people, equipment, dollars — with a customer's testing requirements," says Jim. "We make sure it all comes together for those few moments of data gathering."

Customer's 'Wish List'

Perhaps the most important role of a test director, or TD, is as customer representative. Months ahead of time, the TD listens to each customer's "wish list," or the information the customer hopes to gain from a test, then helps the customer prioritize items and decide which data is absolutely necessary and which is desirable but secondary. "Customers often need guidance about which data they really need from a test," says Joe.

Once test objectives are established, the TD helps design a test profile — a planned agenda that includes "way points," or pre-established milestones, during the test. These way points help

"It's a matter of getting a hundred pieces together at the right time."

TDs and other range personnel determine more quickly whether test criteria are being met at certain times during the test. They also help define when and on what bases the TD decides to continue, reset, or cancel a test once it's begun.

"By the time the test begins," says Bob, "the test director must know how the test is designed, the mission's objectives, and all its stopping



SUNRISE OVER TONOPAH — Test directors Jim Enlow (left) and Joe Dykes (both 2713) relax in TTR's main control room following the cancellation of a morning test (Bob Sherwood, 2713, is the third test director). During a test, the assigned test director occupies the control room, located on the top floor of TTR's four-story control tower, along with team leaders representing the range's key functional areas. Test data is gathered at the range's various telemetry, radar, camera, and tracking stations and relayed to the range's memory bank, also located in the control tower.

points. It's a matter of getting a hundred pieces together at the right time. Each person, each piece of equipment, is important to the success of the test."

TDs also make sure all safety requirements are met before a test. That means knowing the hardware and software systems to be tested and their associated risks. They also must ensure that the range will be vacant for the test, that flight plans are coordinated with Tonopah's air-sharing neighbors, and that certain radio frequencies are reserved for test communications.

During the few days before a test, TDs spend a lot of time on the phone and in meetings. They ensure that all systems are operational, they check and recheck aircraft departure and arrival times, and they hold pre-test briefings with pilots, customers, and range personnel to discuss communication frequencies, test procedures, flight plans, range access, and other vital test information.

Jim says before some tests he visits Navy aircraft carriers on the West Coast to brief tactical fighter pilots. "There's usually a friendly betting pool among the pilots about who can get closest to the target," he says. "One guy came within about a foot of the pole at the center of our main target, but nobody's ever hit it."

Countdown to Zero

On the day of a morning test, a skeleton crew typically arrives on the range by 2 or 3 a.m. for a 6 a.m. test to warm up generators and other equipment. By 4 a.m., the full range staff arrives on the scene, checking equipment and often running a "dress rehearsal" before the test. (See "Testing Business Has Its Pros & Cons" on page eleven.)

"Test directors are primarily decision makers during a test," says Joe. "They keep track of hundreds of variables — weather conditions, security
(Continued on Next Page)

(Continued from Page Six)

TTR: One of a Kind

says Ivory Alexander, Manager of Data Systems Dept. 2712. "We pride ourselves on the quality of the test data that we provide to our customers and the usefulness of our analyses of that data. Our customers have always been the focus." TTR's main customer, of course, is DOE, but TTR also provides data support to DoD, the Navy, the Air Force, the Army, and other Sandia organizations as well.

History Made Here

In the past, TTR has tested aircraft, artillery shells, sensors, penetrator weapons, lay-down bombs, and cruise missiles. During the Persian Gulf War, TTR people provided test data to the Air Force after two new bunker buster penetrator weapons were dropped on a Tonopah target. (For more Tonopah firsts, see "Tonopah 'Old Timer' Recalls Range's 35-Year History" on page six.)

To simulate wartime scenarios as precisely as possible, many tests begin thousands of miles away. As if flying actual wartime bombing mis-

sions, aircraft often fly an established route from US bomber bases or aircraft carriers to Tonopah, locate a target, fire or drop a weapon, and then return to base. "Sometimes they fly in at Mach 1 at 55,000 feet and sometimes they come in 60 feet above ground," says Joe.

Currently, many of TTR's tests are regular stockpile surveillance tests, in which weapons are drawn at random from the US nuclear stockpile and checked for their abilities to fire, launch, or detonate as expected. This activity gives DOE the data necessary to assess the reliability of the US weapon stockpile.

Times Uncertain for Everyone

Nowadays, TTR does approximately 50 tests a year, down from about 200 tests a few years ago. "It's a sign of the times," says Ron. "Cutbacks in weapon-related funding are going to take their toll on weapons development work, especially testing." But you don't have to tell TTR employees that, he says. They're hard at work finding new ways to support DOE's mission and meet the changing needs of the nation. (See "Successful Test Range Faces a Tougher Tomorrow" on page seven.)

But less frequent tests are not the only manifestation of a rapidly changing world. "The weapon systems we test are becoming more sophisticated and more expensive," says Ron. "That means as the number of tests shrinks, the usefulness of the data we obtain becomes more important.

"We need to find ways to provide better and more useful data — continuous improvement — to adapt to this rapidly changing environment," he says.

"We're now looking for programs that fit our strengths," he says. "Times are uncertain for everyone, but as long as the world is an unsafe place to live in, as long as the world continues to change, there will be a need for a place like Tonopah."

...
Ten hours later, as we board a return flight to Las Vegas, we realize we've just experienced one of a handful of US proving grounds for historically significant weapon projects. And as DOE's mission continues to evolve, says Ron, the people at TTR hope they can continue to play a significant role in meeting the nation's needs, whatever those may be. ●

(Continued from Preceding Page)

Testing Tales

and safety status, equipment operational status, aircraft factors, anything that may ultimately affect the quality of the test data or the safety of the people involved."

Once range personnel receive takeoff verification (in tests involving aircraft), the TD stays alert for any problems. "As soon as we begin tracking an aircraft, we start checking our systems," says Joe. "By the time the aircraft reaches the range, we should have already made the decision whether to go ahead or halt the mission."

Basically, says Joe, the TD has three options once a test has begun. "Range is green" means all systems are go. "Withhold" means the aircraft should circle and try the approach again. "Abort" means the test is canceled and the aircraft goes home. "There's a point of no return for every mission," he says, "typically one minute before the main event takes place."

T Plus One

After the event, says Jim, the TD's job is just beginning. "Useful data is the objective," he says, "so there's a lot of number crunching and data analysis after a test." Range personnel examine test

remains, and test film is developed and forwarded to Albuquerque for analysis.

Other post-test responsibilities include keeping the range clear of people until it is determined safe, identifying and correcting problems encoun-

"You already have a good feel for how successful the test was even before you see the data."

tered during the test, and holding post-test briefings with range employees and customers. "You already have a good feel for how successful the test was even before you see the data," he says.

Above all, says Jim, the TD's main responsibility is to make sure the customer is satisfied.

"Customer focus is nothing new here," says Joe. "We've always taken pride in what we do and have approached tasks with a can-do attitude. That's what our customers want and have come to expect from us."

Coming to Tonopah from an Air Force test range a year ago, Bob says he was familiar with TTR's reputation in the defense industry. "TTR is known for its very good product and very good people," he says. "TTR's customers always seem to go away pleased." ●JG

Testing Business Has Its Pros & Cons

Working at TTR or any test range is no field day. TTR employment requires a willingness to put up with 10-hour workdays, erratic work schedules, and a tedious daily commute.

But there's also a side of the testing business that appeals to the kind of people who work at Tonopah. "There's a degree of uncertainty that goes along with field testing," says Jim Enlow (2713), who's worked at the range for 20 years. "Hardware could malfunction, computers could crash, a projectile could land before or beyond the target area. You never know what's going to happen when you leave for work each morning."

For example, he says, during one test the range's radar system failed and a classified weapon was temporarily lost. "As soon as we determined the range was safe," he says, "we got everybody out there looking for the device. We lined up side-by-side and walked, covering as much of the range as possible. After we had searched for two or three days, we found out we had been looking on the wrong side of the road. We found the device

almost immediately. You don't find that kind of adventure in any desk job."

The 'Family Factor'

But sometimes the adventure is not so appealing, he says. For example, a crew once spent 18 nights in a row on the range waiting for the correct weather patterns to do a test. Jim says he traditionally wishes for good weather the night before a test by throwing a penny in the fountain of a hotel in the Tonopah township.

One aspect of the testing business that most people don't think about, says Bob Sherwood (2713), is the "family factor." "Our families have to accept the realities of this business," he says. "As a test director, I may leave home and stay away for two weeks. And I can't always tell them what I'm doing out here. Dealing with that takes a certain amount of trust and family stability."

"Testing can be both rewarding and frustrating," says Range Manager Ron Bentley (2719). "It requires a person with a certain fortitude and spirit of adventure."

this month in the past...



40 years ago . . . Sandia has long supported small business. A 1952 story stated that, during the preceding year, Sandia had placed two-thirds of all purchase orders (worth more than \$20 million) with 2,482 small businesses. LAB NEWS ads included a new "Stroke Saver" electric iron for \$10 (a "stroke saver" iron sounds like it might be better used on the golf course).

30 years ago . . . As the final US atmospheric nuclear tests were being conducted in the Pacific test area (last one was in July 1962), activity for underground testing was picking up at the Nevada Test Site (NTS). More than 100 Sandians were assigned to NTS in June 1962.

15 years ago . . . Scenes from one of the most spectacular crash tests ever to take place at Sandia were depicted in a June issue of the LAB NEWS. A full-sized, surplus locomotive was accelerated on Sandia's sled track to more than 80 mph and crashed into a semitrailer that was sitting at a simulated rail crossing. On the trailer was a nuclear fuel shipping cask (sans fuel) that was being tested for its ability to withstand accidental crashes. The trailer was completely demolished, the locomotive didn't look too bad, and the shipping cask did its job.

Earnings Factors

March 1992

Long-Term Savings Plan for Management Employees (LTSPME) Earnings Factors

AT&T Shares	1.1059
Government Obligations	.9962
Equity Portfolio	.9810
Guaranteed Interest Fund	1.0069
South Africa Restricted Fund	.9795

Long-Term Savings and Security Plan (LTSSP)

AT&T Shares	1.1064
Guaranteed Interest Fund	1.0070
South Africa Restricted Fund	.9794
Equity Portfolio	.9813
Employer Stock Fund	1.1067

Earnings Factors

April 1992

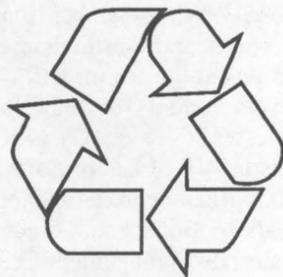
Long-Term Savings Plan for Management Employees (LTSPME) Earnings Factors

AT&T Shares	1.0606
Government Obligations	1.0115
Equity Portfolio	1.0282
Guaranteed Interest Fund	1.0066
South Africa Restricted Fund	1.0068

Long-Term Savings and Security Plan (LTSSP)

AT&T Shares	1.0609
Guaranteed Interest Fund	1.0066
South Africa Restricted Fund	1.0068
Equity Portfolio	1.0281
Employer Stock Fund	1.0610

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This newspaper can be recycled with regular Sandia office paper.



Employee Death

Michael Bakos of NTS Field Operations Dept. 9324 died suddenly June 2. He was 34 years old. Michael had been at the Labs since 1978. He was a senior technical associate.

He is survived by his wife and son.

Retiree Deaths

Frank Vest (75)May 1
Marie Dillon (77)May 18
Gilbert Larsen (59)May 19
Helen Smith (79)May 21
Geraldine Wright (75)May 25
Albert Hall (99)May 28

New PDP Dentist

Albuquerque dentist Bill Valentine has joined the Preferred Dental Plan network for Sandia employees and retirees. Please add him to your PDP Directory: Dr. Bill Valentine, DMD, Family Dental Centers, 6101 Candelaria NE, 883-0005.

Quality Takes Trust**Baldrige Winners Achieved Quality Through Cooperation**

Quality happens at the worker level, said Xerox Corp. executives in the late 1970s. A decade later, that insight earned the Xerox company the nation's highest award for corporate quality achievement — the Malcolm Baldrige National Quality Award for 1989.

Two Xerox employees who witnessed Xerox's cultural transformation from a traditional, top-down management structure into an award-winning, quality-conscious work environment told Sandians their success story from an unusual perspective several weeks ago.

Nick Argona, a representative of Xerox's management, and Mike Sassone, a representative of Xerox's labor union, say the secret to achieving world-class quality performance is to mold a work environment in which workers and managers alike help shape work processes, products, and the future of the corporation.

"First-line workers are the people who know the work processes and how to improve them," says Julia Gabaldon of External Quality Project Dept. 4303. "Everyone benefits when workers and management cooperate to improve quality performance."

The visit included a June 3 dinner meeting attended by Sandia managers and representatives of Sandia's three labor unions. On June 4, Sandians heard the Xerox success story and participated in working group discussions, one for union representatives and one for managers. Later the two groups came together to discuss "lessons learned." The visit was organized by Org. 4303 and Labor Relations Dept. 3560.

Didn't Happen Overnight

Argona and Sassone told participants that Xerox's transformation hasn't happened overnight. It involves a 20-year plan, called the "Xerox Strategic Architecture," that culminates in "Xerox 2000." By the year 2000, Xerox hopes to have achieved world-class quality performance and a culture that fosters continuous improvement and an integrated management style involving employees and management.

Back in the 1970s, says Argona, when Xerox began to look into its declining market share, the company discovered, in disbelief, that the quality

"Quality affects the well-being of all employees, not just management."

of Xerox products was lacking compared to its competitors. The reason: a lack of communication among Xerox's managers, product engineers, and workers about work processes.

To solve the problem, Xerox management knew it would need the full cooperation of the company's labor union. After all, they said, it's the workers who know work processes and how to improve them.

But such a participative, problem-solving culture requires a high level of trust between management and the unions, says Argona, as well as a management willingness to share strategic business information.

Cooperation between the two groups began improving in the early '80s when Xerox found that one of its manufacturing locations wasn't cost competitive. Instead of closing the plant and eliminating jobs, management asked the union to use its manufacturing expertise to help turn the plant around. The plan worked. Today, joint working teams are used routinely to resolve quality issues at Xerox.

Argona says a successful quality program must also include a rewards and recognition program, improved communication processes, and techniques for measuring quality improvements. In addition, he says, all Xerox employees receive a

minimum of two weeks of quality training. "We have 100,000 people talking the same quality language and using the same quality tools," he says.

Shaping Labs Quality

Jan Willis of Labor Relations Dept. 3560 says the message of the Xerox story is that through programs encouraging self-management and employee accountability, a corporate-wide quality culture can be achieved. "Quality affects the well-being of all employees, not just management," she says. "A successful quality initiative must be seen as an initiative supported by management but driven by employees."

"The ES&H and Quality initiatives are real opportunities to get Sandia's three unions involved in major Labs thrusts," she says. Sandia's unions are the Metal Trades Council, the Office Professional Employees International Union, and the International Guards Union of America.

Already, representatives from each of Sandia's unions have been serving as ES&H/Quality coordinators for the past two years, says Jan. In addition, several joint committees have met recently to solve problems in the areas of safety, technology change, health care costs, and subcontracting.

"These committees have helped resolve some



WORLD-CLASS QUALITY — Mike Sassone (standing), representative of Xerox's labor union, discusses union/management cooperation with representatives of Sandia's three unions: (seated, from left) Ray Duran (3435, business agent for the International Guards Union of America), Bill McLendon (3141, president of the Office Professional Employees International Union), and Conrado Otero (2471, president of the Metal Trades Council). Sassone and Nick Argona, Xerox Manager of Organizational Effectiveness, visited the Labs June 4 to tell their story about how cooperation helped Xerox win the Malcolm Baldrige National Quality Award for 1989.

difficult issues, but there's still work to be done," she says. "Grievances have declined in some areas and not in others."

"In a time of decreasing defense budgets, quality is a matter of survival," says Julia. "We need to improve our productivity now more than ever. Everyone benefits from pleasing our customers. The benefits of a successful quality initiative at Sandia include increased job security, greater productivity, and job satisfaction." ●JG

NMSU-Labs Forum Targets Small Businesses**Sandia's Quality Commitment 'Gone South' — To Las Cruces**

Sandia's enthusiasm for the "quality" concept that led Congress to establish a national award for businesses that practice it is fueling a forum at New Mexico State University aimed at enlisting small businesses in a statewide quality crusade.

The July 13 and 14 forum, co-sponsored by Sandia and NMSU, is another step in the efforts of Senators Pete Domenici and Jeff Bingaman to instill



Ricardo "Zuni" Zuñiga

the commitment to quality at all levels in New Mexico, including education, government, and business.

President Al Narath, who has committed Sandia to the concept of total quality management (TQM), heads a contingent of Labs managers and staff members who will participate in the forum. Al will

speaking at the opening-night banquet as well as participate in the following day's presentations.

Ricardo "Zuni" Zuñiga, of Bingaman's Albuquerque staff, says the senator believes the quality initiative can give New Mexico the edge it needs to be able to compete with other states and globally.

"We are a cash-poor state," Zuñiga says. "We can't compete on the same level as many other

states. But a program that is pervasive throughout education, industry, and government, we feel, is something we can use to sell New Mexico: New Mexico — The Quality State."

Domenici will address the opening-night banquet, sharing his views on TQM and the value of promoting "the use of quality improvement techniques throughout government, industry, and education in New Mexico."

The forum is drawing other prominent New Mexicans, too. Former Gov. Garrey Carruthers, a one-time NMSU economics professor, will moderate a panel discussion on small businesses' relationships with Sandia and Los Alamos national laboratories, NMSU, White Sands Missile Range, Honeywell, Lockheed, and Westinghouse.

Other Sandians at the forum will emphasize Sandia's commitment to TQM and relationships with small businesses.

Paul Robinson, VP of Laboratory Development Div. 4000, will emcee the luncheon, which will include a talk by Bob Zaeh, Director of Purchasing and Materials Management Center 7200, titled "Creating A Tomorrow."

Others scheduled to participate are:

● Charles Tapp, Director of Quality Improvement and Primary Standards Center 4300, who will moderate the second-day opening session and speak during that morning's presentations.

● Gail Willette of Org. 7002, a quality coordinator for Division 7000, will discuss "Service Processes: How to Measure Them."

(Continued on Next Page)

Feed Back

Q: Why are medical insurance deductibles based on salary? Other insurance premiums (car, life, etc.) are not based on salary. This seems like social engineering. Why do we have this policy? Is there a valid reason for it, other than social engineering?

A: Before the present formula for deductibles under the Medical Care Plan (MCP) was selected, various alternatives were investigated. The formula we implemented appeared the most equitable, because it was based on the ability to bear cost (somewhat social engineering) and was also administratively acceptable.

One option would have been to increase the deductible based on inflation. Because the deductible had not been increased since 1977, it would have gone up to \$500 for all individuals and would have continued to increase each year thereafter. Another option would have been to deduct a percentage of annual pay, say 0.3 percent; many companies use this formula. However, it is difficult to administer and requires that individual salaries be provided to administrators, which can be a touchy situation. A final option would have been to charge a specific deductible for the company-paid plan, say \$500, and allow employees to purchase a lower deductible through premium contributions.

As with most Sandia benefits, the MCP must be comparable to AT&T practice. AT&T uses a deductible based on salary tiers. Each employee is identified in a tier, but actual salary is not revealed. Because we knew the increased deductible would be a personal budgeting concern for some employees, we implemented the Reimbursement

Spending Accounts (RSA) at the same time. This program allows employees to set aside tax-free dollars from their paychecks to cover eligible health care expenses, including deductibles. Open enrollment for RSA is held in October of each year.

Finally, beginning Jan. 1, a Health Maintenance Organization (HMO) option was offered to Sandians in Albuquerque. Enrollment for this program is also in October. Under an HMO, instead of deductibles, a copayment is required at the time of treatment.

Ralph Bonner (3500)

Q: In an in-flight magazine, I found a quiz titled "Are You Motivating Your Employees?" posed by Bill Fromm, author of the book The Ten Commandments of Business and How to Break Them. One question asked whether perks such as reserved parking spaces for executives have an impact on company employees. The answer was yes. Further, it said, "Perks such as reserved parking spaces cost companies plenty. In fact, company cars are not expensive but reserved spaces are. They cost companies their employees' loyalty and their sense of teamwork. The employee who gets to work first should get the best parking spot. Period. When you begin to separate 'officers' from 'enlisted men' you end up with not one, but two, teams. And two teams don't work as one, they compete."

A: The parking situation was revised last year to give the most favorable treatment to external customers and those with medical handicaps, and the number of reserved parking spaces was re-

duced in each area. I've been told that in some areas, employees who get in early can park closer to building entrances than if they had parked in the reserved lots. However, further changes will be considered.

Al Narath (1)

Q: The smoke-free building policy at Sandia has concentrated the smokers at every entrance to a building. Everyone must now pass through the "ash tray" when entering or exiting a building. I support and enjoy the smoke-free environment at Sandia and I would like to suggest that the smoke-free zone be extended to 50 feet beyond any building entrance (or at least one smoke-free entrance be designated for each building).

A: Sandia's smoke-free policy has substantially improved the working environment for the majority of Sandians, while significantly complicating the lives of those who continue to choose to smoke. As you point out, smokers now congregate near building entrances so they can smoke outside without spending too much time away from their work places. I appreciate your concern and the irritation it causes you, and suggest that if there is a specific location that is especially troublesome, you contact the building coordinator and explore alternatives. I hope we eventually will have a smoke-free workforce, but until then, dilemmas such as the one you cite probably can be best managed with mutual concern among smokers and non-smokers.

Larry Clevenger, MD (3300)

(Continued from Preceding Page)

Sandia's Quality Commitment

• Art Trujillo, Manager of Process Improvement/Benchmarking Dept. 4313, will speak on "Process Improvement: How to Achieve It."

Zuñiga says Bingaman has been pleased with the reaction to his encouragement of quality initiatives and believes New Mexico businesses of all sizes perceive their adoption as a tangible advantage.

Bingaman has suggested phasing in classes on the importance of quality, to be taught at every state university and community college, and eventually offered to all New Mexico workers, including those who have finished their formal education.

"Quality is not only free, it pays," says Zuñiga. "There may be a little investment on the front end, to go through the training, but the business that can be made up in increased productivity and the expanded markets you can have by having a TQM program in place really makes up for any up-front cost."

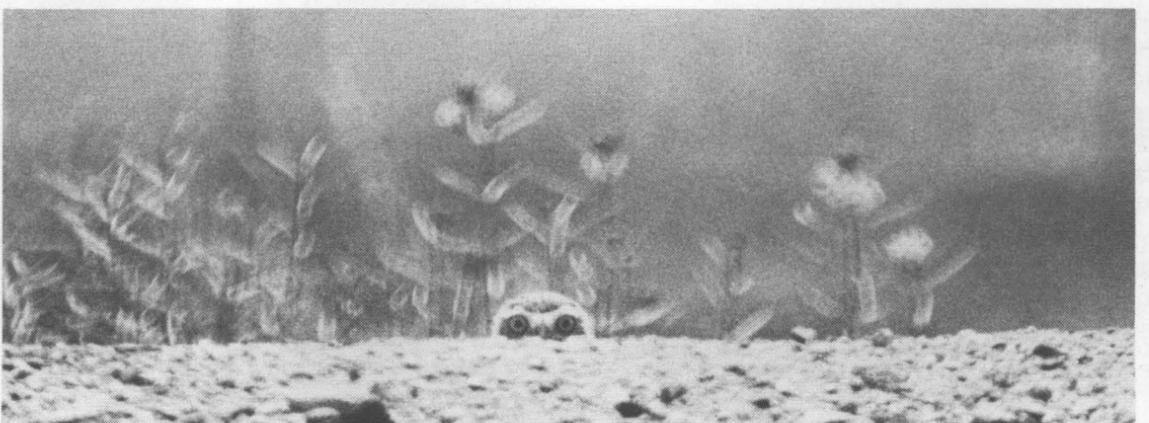
Sandia is playing a big role, Zuñiga says: "Sandia is a real resource for the quality state initiative. It has done quite a bit by way of providing quality training — not only internal training on quality products, but training for workers and management."

And, he adds, "Sandia has offered — and we're certainly going to take them up on the offer — to be a cornerstone of the quality state initiative." •

Congratulations

To Toni and John (9617) Espinoza, a son, Joshua Keith, May 27.

To Lynn and Scott (2761) Klenke, a daughter, Alyssa Lynn, June 5.



A burrowing owl keeps a wary eye on LAB NEWS photographer Mark Poulsen.

Git Along Little Doggies

Wanna Be a Prairie Dog Pal?

Prairie Dog Pals, a local preservation group, is looking for some weekend volunteers to help trap and relocate a clan of the cute critters that is now living southwest of Eubank and Southern where a new Kirtland AFB building is being constructed.

If they aren't trapped and moved, some could be injured or killed by construction activities, says Kay Shaffer (contractor). Volunteers are needed right away; although pre-construction activities are already under way by the building contractor, the group has been told that it can continue trapping and moving the animals, she notes. Anyone who can spare a few weekend hours is welcome. Leaders of the group will provide guidance and equipment to safely trap and transfer the dogs. To volunteer or for more information, call Prairie Dog Pals on 293-2863.

A colony of burrowing owls also lives in the construction area, Kay notes, but because they are federally protected, their nesting area will be roped off so construction activities won't disturb them.

Big Bucks for New Mexico Education**Sandians Help Get \$10 Million Grant for Schools**

Thanks in part to Sandians who are highly interested in education and who are already involved in educational outreach programs, New Mexico now has \$10 million to help upgrade math and science teaching during the next five years. The money is a grant from the National Science Foundation's (NSF) Statewide Systemic Initiative (SSI) Program.

Several New Mexico groups collaborated to prepare the proposal, and an NSF proposal review noted that Sandia participation was a key element in the proposal's success. "The Science Advisors [SCIADS] Program which Sandia National Laboratories conducts is outstanding," states the proposal review. "This program places Sandia scientists and mathematicians in schools so that they can partner with teachers in order to enhance science and math learning and teaching." (See June 12 LAB NEWS for SCIADS feature story.)

New Mexico was one of only 10 states this year to get into the SSI program, which requires a

Sandia's educational outreach experience will serve as a model and cornerstone for educational restructure.

focused state plan for the restructuring of math and science education and the coordinated involvement of federal, state, and local resources. New Mexico plans to implement its successful "Re:learning" model for school-based reform in grades K-8 in order to incorporate new content and teacher training in math and science. Sandia and Los Alamos, local businesses, and state universities will help.

The National Education Goals Commission's annual report for 1991 said that only 47 percent of New Mexico's high school students were enrolled in advanced algebra, 33 percent in chemistry, 15 percent in physics, and 8 percent in calculus. The same report said only 10 percent of New Mexico's public school eighth graders were considered competent in math.

'Got to Change the System'

"Change can't simply be mandated by school districts or state boards," says Mike Wartell, Manager of Education and New Initiatives Dept. 35 and a principal investigator for the grant. "In order to make a real difference in math and science education, we've got to change the system. To achieve that, it's going to take everyone getting involved."

Sandia's educational outreach experience will serve as a model for other companies and educational stakeholders as well a cornerstone for the types of educational restructure that need to take place, says Mike. Almost 100 Sandians will be involved in various aspects of New Mexico's educational improvement efforts. Mike, along with David Colton of UNM and Pedro Atencio of New Mexico's Re:learning program, will coordinate statewide improvements made possible by the NSF grant. Sandia Science Advisors will offer increasing technical support.

Trying A New Style

"One of the things we're working for," says Mike, "is a movement away from the traditional lecture style of teaching science and math towards more hands-on involvement by students.

"We also want to teach math and science with an emphasis on problem solving and understanding instead of memorization," he says. "Sandia's Science Advisors will play a big role in that area."

New Mexico plans to use a school-by-school approach and has designed its program to involve many labs, groups, and programs including Sandia, Los Alamos, NASA and Phillips laboratories; companies like IBM, Honeywell, and Lockheed;

and state educational projects such as New Mexico Math, Engineering, Science Achievement, Inc., Comprehensive Regional Center for Minorities, and Re:learning. Individual community members, parents, and teachers also will be involved.

NSF sees the role of the national labs in the state's educational goals as extremely important, aiding the cause in ways not otherwise made possible. The work of Sandia scientists in the SCIADS program is seen as particularly valuable.

"Sandia scientists serve as excellent resources to teachers, demonstrating fundamentals through hands-on experiments and providing science and math knowledge for curriculum support," says an

NSF statement about the project, "but more important, they serve as role models to students, helping them connect courses to the knowledge and skills necessary for future employment and citizenship."

The program will focus on approximately 115 schools each year so that in five years every K-8 school in New Mexico will have been reached. Each school in the program will have a change-agent team composed of a lead teacher, at least two other teachers, a technical support person, a community representative, parent, and a school/district administrator. Teams will work to tailor changes to the specific science and math needs of each school. ●DT

Sandians Earn Extra Credit for Their Efforts

Most teachers would gladly give Sandians Marvin Moss (251), Paul Page (5500), Art Guenther (4100-B), and Bob Huelskamp (4112) extra credit for their work in education. Marvin, Paul, Art, and Bob served along with Mike Wartell (35) on New Mexico's Steering Committee for Systemic Change in Math and Science, which produced the state's \$10 million winning proposal (see main article).

As members of the steering committee, Paul, former Educational Outreach Coordinator; Bob of New Initiatives Department; and Mike, Activities Manager of Education and New Initiatives; worked to bring Sandia capabilities and commitments into the New Mexico proposal. They also brought along their own

strong commitments to improving educational opportunities for state youngsters.

Art, Science Advisor for Laboratory Development and the Governor's Science Advisor since 1988, was a national reviewer of NSF Statewide Systemic Initiative proposals in 1990. His reviewing experience proved helpful to the steering committee.

Marvin served on the steering committee not only as a Sandian, but also as past president of the New Mexico Academy of Science, and as co-chairman of the Academy's Explora Science Center Project. The Explora Science Center, a city funded Quality-of-Life program, will be a hands-on science museum for children and adults.

New Sandia Bus Stops Announced**Bus and Van Pool Vehicles Prohibited Inside Tech Area Beginning July 1**

Sandia, Albuquerque employees who have been entering Tech Area 1 on buses or in van pool vehicles will be getting a bit more exercise beginning July 1 when such vehicles can no longer enter the area. Commuter buses and van pool vehicles will now unload passengers at designated points outside the gates, and vans have been assigned parking spaces convenient to riders.

The ban on commuter buses and vans inside the area was made after DOE's Kirtland Area Office (KAO) expressed concern about security and safety issues late last year, according to Jim Martin, Director of Sandia Safeguards and Security 7400. KAO Manager Kathy Carlson asked Sandia to review alternatives and to propose a system that would ban the commuter vehicles from the area but allow continued bus and van pool service for Sandians.

Jim and others in his group worked with Sandia's commuter assistance coordinator, Linda Stefoin (7543), to develop a plan, and Carlson approved it this spring with a July 1 effective date.

The policy affects all Sun Tran (Albuquerque) buses, Sanchez buses serving Belen and Los Lunas, and the seven van pool vehicles that serve various small communities.

Sun Tran buses will have designated stops. The routes and their stops ("trippers" are special buses serving Sandia only):

- Route 90 (Rio Rancho), Route 31 (Wyoming Blvd.), Wyoming Tripper, and Louisiana Tripper — Bldg. 800 and Gate 10
- Eubank Tripper and Comanche Tripper — Gate 6 and Gate 4
- Chelwood Tripper — Gate 10 and Area 4 (also stops at intersection of O St. and H St. to pick up transfers going to Area 4).

Specific Sandia stops for Sanchez buses have not been established; within reason, Sanchez drivers will drop off and pick up passengers at stops of their choice.

Detailed information about bus routes and schedules is available from the bus drivers, says Linda. Sandians who have other related questions or need general information about commuter assistance can call her on 4-7433. ●LP

Fun & Games

Track and Field — The Sandia Labs Track and Field Club had considerable success last month, winning the New Mexico Corporate Cup track and field meet and placing second in the Corporate Cup road race. Sandia's team competes in Division 1 (companies with more than 2,000 employees) against Albuquerque Public Schools, Los Alamos National Lab, Presbyterian Hospital, and Lovelace Medical Center.

Based on their performances, several Club members have qualified to compete on the AT&T team at the National Corporate Cup competition July 11 and 12 at the University of California, Irvine: Roger Assink (1812), Cindy Beer (9543), Tom Cannon (6908), Jim Garsow (9212), Peter Green (1845), Katherine Hansen (323), David Honea (9311), Becky Hunter (5000), John Larson (7142), Pam Leslie (1815), P. J. McKee (7142), Bob Nellums (9722), John Otts (35), Larry Ruggles (1273), John Sackos (9727), Fran Stohl (6212), and Mary Walker (1511).



UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS

Deadline: Friday noon before week of publication unless changed by holiday. Mail to Dept. 7162.

Ad Rules

1. Limit 20 words, including last name and home phone (the LAB NEWS will edit longer ads).
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.
13. "Work Wanted" ads limited to student-aged children of employees.

MISCELLANEOUS

APPLE IIC, color monitor, external drive, mouse, joystick, ImageWriter II printer w/ribbons, many programs, \$1,000 OBO. McRee, 294-6091.

WOMAN'S DINNER RING, yellow-gold/diamond, approx. 3/4ct, replacement valued at \$4,225, will sell for \$995 or consider trade for carpentry work. Stude, 897-4352.

MINIATURE DACHSHUND, male, approx. 4 yrs. old, w/current shots, free to loving home. Lucas, 255-1401.

SOLID MAPLE DESK, \$250; 3 oak-veneer desks, \$100/ea.; Toshiba BD 5110 copier, \$1,250. Wehrle, 299-2959.

VIDEOTAPE TRANSFER machine, Sony Beta Hi-Fi VCR SL-2710, originally \$1,200, still in carton, excellent condition, \$250. Matthewson, 883-6649.

SATELLITE SYSTEM, STS model MK100 receiver w/auto antenna positioner & VCII+ descrambler, approx. 3 yrs. old, great shape, \$1,200 OBO. Barker, 899-2018.

SHOPSMITH, \$700 OBO; solid wood home/office desk, 35"x 59"x 28", typewriter storage w/pull-up hinged shelf, \$200. Jones, 881-8722.

REMINGTON 1100, 3" magnum, 30" barrel, full choke, \$300; Pearl snare drum, maple shell, excellent condition, w/stand, \$200 OBO. Craig, 293-8369.

YAMAHA EVERETT PIANO, console, bought new, used 7 yrs., attractive case compatible w/SW decor, \$1,500. Hooper, 299-5593.

SAGE 90" #5 LINE GRAPHITE III 590 RPL, w/sock & tube, \$130. Nichols, 281-0801.

NINTENDO, w/8 games, \$150; electronic keyboard, 32 keys, \$25; dress slacks, petite size 6, various colors; boy's clothing, like new, sizes 8-16. Gonzales, 823-9511.

CARTER RV AWNING, 21-ft., used twice, w/mounting instructions; 550-gal. oil storage tank & 14-ft. fiberglass boat hull, free, you haul. Roh, 869-2108.

DRAFTING TABLE, restored 8-ft. oak/maple table w/large drawing drawer & small side drawer, excellent condition, \$500 OBO. Cygan, 298-5126.

CONCERT TICKETS: James Taylor, July 5, 3 abreast, Sec. 6/Row 24/Seats 7, 8, & 9, \$90; single, Sec. 20/Row 44/Seat 21, \$30. Moran, 892-3024.

TWO PARAKEETS, blue, w/cage, \$15; upright freezer, 18 cu.ft., new thermostat, excellent condition, \$125. Bruce, after 6 p.m., 897-7416.

QUEEN-SIZE WATERBED, new mattress, dark wood, bookcase headboard, \$125. Bruce, after 6 p.m., 897-7416.

PUPPY, Great Pyrenees, AKC registered, born 5-13-92, \$200. Wrobel, 891-8409.

FORMICA KITCHEN counter top and cast iron sink, includes faucets, 96", "L" shape; 48" extra section, like new. Rael, 884-4778.

ANTIQUA BEDS, twin, one oak, one maple, plywood, 1/2"x 4'x8" box, pegboard, 1/4"x4'x8"; misc. plumbing, electrical, and building supplies, Schiess, 262-0379.

DINING ROOM TABLE, w/extension, 6 chairs, matching china hutch, jade finish, \$300; misc. table lamps, \$5 each. Cleveland, 299-7420.

KITTENS, 7 weeks old, free to good home. Farrell, 292-1568.

.22 LONG RIFLE SHELLS, \$8.50/500; 12-gauge shotgun shells, game load, \$3.25/25; AT&T computer keyboard, #KBD301, \$35. Falacy, 293-2517.

SOFA & LOVESEAT, almost new, light beige, \$300; lawn feeder; Craftsman Lawn Mower; old Kirby vacuum cleaner; compressor. Lucero, 821-6735.

SAFE, Herring, Hall, Marvin, 4'x29", 4-combination, fire proof, T-20 rating, will deliver, \$800. Hess, 260-0032, 873-2131.

SANDIA CAPS, new style w/SNL logo, black & gold, \$8; Sandia cups & T-shirts, \$7. S. 14 Village Proj: LAB NEWS Bldg. 814. Shunny.

FULL BOX SPRING mattress, \$90; six-drawer dresser, white & gold, \$65; brass lookalike headboard & frame, \$35, complete \$190. Smith, 299-7151.

YARD SALE, 2512 Greta NE, Saturday, June 27, 8 a.m.-4 p.m.; girls clothes, newborn to 3T, toys and misc. items. Parson, 291-8394.

AKC REGISTERED Rottweilers, 12 weeks old, 2 female, 1 male, \$200 each. Moore, 296-1248 or 899-1347.

FLY TYING KIT, great for the beginner, includes vise and bench, materials, hooks, necessary tools, instruction books, \$35. Freyermuth, 299-2053.

KITTENS, Siamese mix, long-haired chocolate point, free to good home. Tomek, 296-4840.

SEARS CRAFTSMAN 6" disk sander-polisher, 2 spd., double insulated. Schuster, 296-9334.

TEXAS INSTRUMENT PC 100c printer with TI 59 calculator, includes software, magnetic cards, \$70. Henry, 266-6467.

MULTI-FAMILY GARAGE SALE, Saturday, June 27, furniture, appliances, clothes, household goods, Ridgecrest and Kathryn SE, 8 a.m. Cook, 266-6088.

RUMMAGE SALE, Saturday, June 27, 8 a.m. to 4 p.m., Church of the Good Shepherd, 7833 Tramway Blvd., follow signs from San Rafael. Glaser, 293-8110.

DINING SET, rattan and glass, four chairs w/white cushions, excellent condition, \$250. Bjornberg, 281-1922.

NIKON F2 w/28-90 Vivitar zoom lens, includes flash and carrying case, \$425, men's 10 spd. Peugeot, \$150. Malone, 266-2834.

RUGER 22 RIFLE, 50 Rd. MAG., folding stock, \$250; Marlin 22, 24 Rds, tube fed rifle, \$200. Wanya, 891-0018.

BUNK BEDS, oak, stack or separate, book case in headboard, inner spring mattresses. Moss, 298-2643.

KITTENS, free; Netherland Dwarf, miniature rabbits; exer-cycle, \$25. Sharp, 243-1498.

CAPTAIN'S BED, white laminate, twin size mattress, 2 drawers below, removeable bookshelf headboard, 7 yrs. old, good condition, \$95. Blanford, 292-6494.

THREE LUJAN interior doors, 30" x 80"; two Lujan interior doors, 24" x 80"; 3 drapery rods, 72" to 96", all items \$3 each. Rudolph, 298-0941.

DECORATOR GARAGE SALE, blinds, fabric, accessories, household goods, 8 a.m. to 4 p.m., June 27, 8024 Classic NE. Smith, 281-2940.

SERVING CART, 2 levels, glass, brass trim, casters, oval, 25x19, \$15. Roberts, 255-9527.

POOL, above ground, 12'x36", w/equipment, \$175; radial arm saw, \$140; window swamp coolers, \$35; misc. furniture, make offer. Ayers, 291-8216.

DOUBLE BED, \$25; bookcase, \$25; small tables, and many other miscellaneous items. Drebing, 293-3335.

KENMORE gas clothes dryer, gold color, full size, good condition, \$75. Collier, 299-0182.

AQUARIUM, 70 gallon, with stand, most accessories included, \$100. Hanley, 823-9731.

SWAMP COOLERS, one window mount and one portable combination cooler/humidifier, both two speeds, \$25/each. Dreike, 299-6670.

NEW CARPET, 12' x 10', medium pile, solid color, soft southwestern tone, \$80. Stephenson, 296-9330.

14" VGA MONITOR, \$225; also sound blaster card, \$80, will sell both together for \$275. Sulzemeier, 293-2387.

TRANSPORTATION

'89 PLYMOUTH VOYAGER SE, 20,000 miles remain on 7/70 warranty, trailer hitch, cassette. James, 344-7854, leave message.

GIRL'S SCHWINN Caliente bicycle, 24-in., red, w/basket & Mickey Mouse bell, in excellent condition, \$95. Wagner, 823-9323.

Early Deadline

Because of the July 4 holiday, deadline for ads and other submissions to the July 10 LAB NEWS is noon on Thursday, July 2.

'84 STARCRAFT pop-up camper, sleeps 6, 2W refrigerator, furnace, stereo, converter, boat rack, excellent condition, \$2,500. Martin, 296-8154.

'84 CORVETTE, standard 4 x 3, w/new overdrive transmission & clutch, CD player, car cover, removeable top, 68K miles, runs great, \$12,350. Blackledge, 294-6030.

'83 PLYMOUTH Reliant station wagon, good in-town transportation, \$350. Cooper, 888-4150.

'85 FORD TEMPO, 4 dr., AT, AC, PS, PB, excellent condition, \$2,195. Padilla, 877-2116.

'67 MERCURY COUGAR, AT, PS, PB, AC, new tires, nice interior, street neat, classic, \$2,900. Morris, 296-8680.

'85 MALLARD MOTORHOME class A, 31 ft. w/car caddy, steer safe, generator, many extras, 19,000 miles, top condition. Baca, 265-2881 or 296-6985.

'73 OLDS CUTLASS, 4-dr., AC, AT, AM/FM/cassette, well maintained, 91K mi. Fianning, 298-0743.

'76 MERCURY Monarch, GIA series, 4-dr., 351 engine, all power, white exterior, 47,140 original miles, always garaged, \$3,200 OBO. Hole, 255-1444.

Feeling Rejected? Please Follow the Rules

Some "unclassified ads" are rejected because they do not meet requirements. LAB NEWS staff members do not have time to call people who submit ads, so non-qualifying ads are rejected *without notice*. The most common reason for rejected ads is that Sandians do not list their full names and organization numbers; this information is not printed, but it is necessary to verify that the ad was submitted by a Sandian. The rules are printed at the top of this page in each issue, and Sandians are encouraged to clip and save a copy.

ATV COOT, 12 HP Tecumseh engine, 4-wheel steering, new battery, military tires, located 1413 Guaymas, NE. Houghton, 299-3386.

'71 FORD Pickup, 302 V-8 engine, 4 speed transmission, good tires all around, good engine, very fast, \$900 firm. Sanchez, 836-2782.

'91 LANCE LC 900, 11.3' cabover camper, 2.8 Ohan LP generator, 3-way fridge, 8' awning, queen-size bed, shower, 7 mo. old, \$15,500 firm. Loving, 281-5528 (leave message.)

'75 MOTORHOME, 21', Dodge chassis, 360 V-8 rebuilt transmission, excellent condition, well maintained, \$5,500. Salmen, 881-8612.

'75 FORD, F-250, 4x4, 390 engine, runs well, body has little rust, \$2,200. Miller, 281-3959.

'90 HONDA ACCORD, automatic, air, tinted windows, AM/FM cassette, charcoal gray, great condition, 34,000 miles, \$10,500 OBO. Perrine, 293-1429.

'78 HONDA HAWK 400cc motorcycle w/windshield, electric and manual start, well maintained, garaged, 2-cyl, 15,000, full-face helmet, extras, one owner, \$575/OBO. Newman, 266-6928.

'81 LeBARON, AT, AC, tilt, cruise, 225 cu. in., new vinyl, 6-cyl., \$1,200. Roth, 881-3824.

BICYCLES: 2 Diamondbacks, w/hand & pedal brakes, 16-in. Miniviper-Red, 20-in. Viper-chrome. Mancini, 821-4039.

TEAM FUJI 12-SPD road bike, 57 cm frame, Scott DH handlebars & standard drop bars, Araya 700c Rims, \$110. Gerwin, 881-0028.

'79 TRANS-AM, rebuilt engine, T-Tops, aluminum rims, powerful and fast, \$3,500; '92 Haro Extreme Mountain Bike, 21 spd., Shimano 500 LX, new \$687, asking \$500. Abeyta, 247-3817.

'88 BRONCO XLT, V-8, 53K miles, gray, \$12,500, excellent condition. Tapia, 299-1941 after 5 p.m.

'81 MAZDA RX-7, runs great. Abel, 831-5043.

TWO CENTURION road bikes, 1 newer and heavier, one older and lighter, both nice, either bike \$87. Paulsen, 880-0485.

'88 BOUNDER motorhome, basement model, 33 ft., class A, auto levelers, awning, generator, and loaded with extras, 21K miles. French, 298-9292.

'88 PROWLER REGAL travel trailer, 33', AC, awning, 1,800 miles, \$12,500, OBO. Peterson, 296-9443.

'91 CHEVY S-10 BLAZER, TAHOE, 4x4, AT, PS, PB, cruise, tilt, cassette, PWR locks, immaculate condition, below book. Loukota, 294-7353.

'91 SUZUKI GSXR750 motorcycle, 3,500 miles, excellent condition, \$5,900, OBO. Stanley, 255-3083.

'83 MUSTANG convertible, 5.0 Liter, 68,000 miles, very good condition, \$5,000, OBO. Goodrich, 299-6684.

'82 KAWASAKI KZ440-LTD, 1,200 miles, new condition, belt-drive fairing, luggage box, \$850. Gosler, 828-0728.

'76 PONTIAC GRAND PRIX SJ, one owner, 107K miles, nice, \$1,500. Nielson, 292-6188.

SCHWINN LE TOUR bicycle man's 10 spd., 27", excellent condition, \$75. Hanley, 823-9731.

TIME-TRIAL "FUNNY" bike, Tange aero-tubing, 24" front wheel, 700C rear, complete bike \$500. Strip, 292-7490.

'73 PLYMOUTH DUSTER 340, four barrel, original paint, factory sun-roof and AC, \$2,500. Lloyd, 889-8934.

'90 YAMAHA RT180A trail/dirt bike, \$1,050; 1990 Comet Motorcycle Trailer, \$275, complete set of riding gear, various prices. Stuart, 265-7315, after 5 p.m.

BOAT, 12 ft. aluminum, 6 HP Johnson outboard w/gas tank and line, boat trailer, extras. Complete trolling outfit \$1,100. Garst 884-5176.

'83 ITASCA MOTOR HOME, Sunflyer 27', excellent condition, microwave, T.V., other extras. Shelby, 292-4605.

'84 HONDA, V-65 Sabre, low mileage, new condition, garaged, \$2,200. Walston, 296-0372.

REAL ESTATE

CABIN SITE, Durango Vallecitas area, tall pines, beautiful, utilities, \$8,000. Patterson, 299-1062.

3-BDR. HOUSE, corner lot, near Spain & Morris, 1,200 sq. ft., 1-3/4 baths, double garage, large fully landscaped lot, w/sprinklers, \$97,000. Van Slambrook, 299-1626.

4-BDR. HOME, study, den, 3 baths, appraised at \$90,000, near UNM and Kirtland, make offer. Hendren, 883-5070.

4-BDR. TOWNHOUSE, 1,350 sq. ft., 1-3/4 bath, fireplace, adobe accents, private southwest area, skylights, \$57,999. Eddie, 845-9181 or 836-7144.

4-BDR, 3 BATHS, 3,000 sq. ft. w/garage, \$225,000; 2.4 & 1.3 acres, \$60,000 and \$35,000, all located in Peralta. Lackey, 869-9333.

20 ACRES, Moriarty, off paved road, gas, electric nearby, good site for trailer park, \$1,500/acre; rec. ok. Shunny, 265-1620.

3-BDR. HOME, southeast, close to base, 1-3/4 baths, den, double car garage, sprinklers, back yard access. Brinkley, 255-2783.

4-BDR. HOME, 2-1/2 baths, family room, fireplace, installed vacuum, water softner, near schools. Burch, 299-1972.

3-BDR. HOME, 1,300 sq. ft., 1-3/4 bath, finished 2-car garage, great backyard, RV access, Taylor Ranch, near schools, \$72,500. Baca, 898-2244.

4-BDR. BRICK HOME, 2,100 sq. ft., 1-3/4 bath, fantastic view, family, living, dining, reading rooms, 2-car garage, Tramway & Candelaria, \$149,000. Norwood, 292-0072.

3-BDR. HOME, 2,300 sq. ft., large landscaped cul-de-sac lot, Morris/Comanche, \$130,000; trade for \$70-80,000 home. Blanford, 292-6494.

WANTED

NIKON CAMERA, body in good condition, must be reasonable. Montoya, 296-4268.

'87 OR '88 DODGE Caravan, Plymouth Voyager, LE, light color, V-6, reasonable mileage, good condition. Liguori, 256-3613.

HONDA generator 1,000-watt to 4,000-watt. Patterson, 299-1062.

GIRL'S fall and winter clothing, size 3 toddler. Reuss, 889-3641.

ANTENNA, FM, VHF, UHF. Zaffery, 296-0724.

LINCOLN LOGS, prefer dark logs, partial sets okay. Torczynski, 292-7191.

WORDPERFECT, non-windows version, 5-1/4" diskettes, works with laser printer. Sobolik, 292-3959.

TWO-WHEEL cargo trailer, prefer enclosed, 5'x8', must have standard car tire. Yingst, 884-3812.

PHONE NUMBER of person who called offering to sell a Troy Garden Shredder; lost number, please call. Strip, 292-7490.

TREAD MILL, prefer 10 mph model; stair stepper. Sharp, 243-1498.

KIDDY CART, bike trailer for hauling little one. Bottomly, 344-2137.

SHARE-A-RIDE

CORRALES RIO RANCHO van-pool: Tech Area 1 gate pickups for bus riders. Kuszmaul, 892-4466, Boatman, 892-3570.



Coronado Club Activities

Let Your Kids Go to the Dogs On Family Night

HUGGS AND SAMMY bring in their performing dogs this evening, June 26, to entertain the kids (and grownups, too) from 5:30 to 6:30 p.m. Then it's Kids' Bingo — just watch the little nippers' excitement when they come up with a winner. A buffet line will be open from 5 to 8, featuring a kids' spaghetti or hot dog special for \$1.50 and an adult Italian meal with spaghetti and more for \$2.95.

CELEBRATE YOUR INDEPENDENCE at the Club's July 4th Pool and Patio Party. You can enjoy the big brass blasts of the Albuquerque Concert Band from noon to 2 p.m., and then dance to Bob Weiler and Los Gatos from 3 to 6. There will be plenty of family-style activities, plus an a la carte buffet from noon to 5 p.m., featuring hamburgers, hot dogs, BBQ ribs, fried chicken, and all the good things that go with them. Pool and patio

admission is free for Club members, \$3 for guests. Note: On Friday, July 3, Club offices will be closed, but the pool and patio will be open until 9 p.m. as usual.

GREAT BINGO MONTH — Bingo fanatics, take note: July has five Thursdays, and that means five bingo nights. The games begin every Thursday with the Early Bird session at 6:45. Card sales and buffet line both open at 5:30.

T-BIRD CARD ALERT — That ol' cardmaster Jim McCutcheon doesn't want you to come to the Club and play cards — unless you like to have a good time with great people. The Thunderbird retiree card sessions are every other Thursday from 10 a.m. until midafternoon. Upcoming dates: July 9 and 23, August 6 and 20, and September 3 and 17. Go ahead and mark your calendar!

Take Note

Volunteers are needed tomorrow, June 27, to help maintain the old and new La Luz trails. The trails will be improved, and the connection between them will be made clearer. No trail-building experience is required; a safety talk and tool demonstration will be given. Tools and hardhats will be provided by the Forest Service, but volunteers should bring long pants and sturdy work shoes (not sneakers), rain gear, hat, gloves, water, sun screen, energy snacks, and a sack lunch. No children or pets should come, and persons under 18 must be accompanied by a parent. Volunteers will gather at 8:30 a.m. at La Luz trailhead, in the Juan Tabo Recreation Area. Work will last until 3 p.m. For more information, contact Frank Hill on 256-0350.

Old-car buffs will get a chance to see some classics when the Interstate Batteries Great American Race completes its ninth of 13 days of competition at the Ramada Hotel in Albuquerque at 6 p.m. on Tuesday, June 30. Up to 100 antique cars from 30 states and five countries, including four from New Mexico, will arrive at the Ramada at Menaul and Louisiana Streets. Spectators may view cars and visit racers after all cars arrive. The US Navy Ceremonial Band will give a 45-minute concert after the last car arrives.

Events Calendar

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

June 26 — Concert, New Mexico Gay Men's Chorus; 8 p.m., St. Andrews Presbyterian Church (5301 Ponderosa NE, 2 blocks north of San Mateo & Co-manche), 296-9215.

June 26 — Workshop, "Change the World, One Family At A Time," an active parenting leader certification workshop; call 1-800-825-0060, ext. LCW.

June 26-27 — "Into the Woods," Albuquerque Civic Light Opera presentation of Stephen Sondheim musical about favorite fairy tales happening at the same time in the same part of the forest; 8 p.m., Fri.-Sat.; 2:15 p.m. matinee Sun.; Popejoy Hall, 345-6577.

June 26-27 — "Beirut," by Alan Bowne, powerful drama about love and sex in an AIDS isolation camp in the not-too-distant future, Theatre-in-the-Making presentation, show contains nudity and frank sexual content, no one under 17 admitted; 8 p.m. Fri.-Sat., CenterStage (3211 Central NE), 260-0331.

June 26-29 — New Mexico Arts & Crafts Fair, 31st annual summer festival of the arts, more than 200 juried New Mexico artists and craftspeople, food booths, continuous entertainment; 10 a.m.-10 p.m. Fri. & Sat., 10 a.m.-6 p.m. Sun.; State Fairgrounds, 884-9043.

June 26-30 — "Lola Alvarez Bravo: Portraits of Frida Kahlo," study of Frida Kahlo by one of Mexico's foremost photographers; 9 a.m.-5 p.m. Tues.-Sun., Albuquerque Museum, 243-7255.

June 26-July 12 — "Accidental Death of an Anarchist," satire by Italian playwright Dario Fo; explores the suspicious death of an anarchist; 8 p.m., Fri.-Sat.; 6 p.m., Sun.; Vortex Theatre, 247-8600.

June 26-Aug. 2 — Exhibit, "Peruvian Photography 1900-1930," Santa Fe resident Ed Ranney traveled to Peru to make prints from early 20th-century photographic negatives of Martin Chambi, Miguel Chani, and the Vargas Brothers (many have never been seen in the US); 9 a.m.-4 p.m. Tues.-Fri., 5-9 p.m. Tues., 1-4 p.m. Sun.; UNM Art Museum, 277-4001.

June 26-Aug. 16 — Exhibit, "Thanks for the Mimbres," an investigation of how anthropologists and tourist promoters have transformed religious images into popular culture icons representing "otherness" of the Southwest; 9 a.m.-4 p.m. Tues.-Fri., 5-9 p.m. Tues., 1-4 p.m. Sun.; UNM Art Museum, 277-4001.

June 26-Aug. 16 — Exhibit, "Our Land/Ourselves," works on paper by Native American artists focusing on the land and its inhabitants through metaphysical, metaphorical, allegorical, and political perspectives; 9 a.m.-4 p.m. Tues.-Fri., 5-9 p.m. Tues., 1-4 p.m. Sun.; UNM Art Museum, 277-4001.

June 26-Aug. 28 — Exhibit, "Native Iconographic Influences in Raymond Jonson's Painting," investigates Raymond Jonson's incorporation of Southwestern iconography, drawn from Native American and Hispanic cultures, in his early New Mexico work; 9 a.m.-4 p.m. Tues.-Fri., 5-9 p.m. Tues., 1-4 p.m. Sun.; UNM's Jonson Gallery, 277-4967.

June 26-Sept. 6 — "Richard Ross: Museology," an

exhibition of large-format color photographs of various areas of museum spaces throughout the world; 9 a.m.-5 p.m. Tues.-Sun., Albuquerque Museum, 243-7255.

June 12-Sept. 6 — "First to Fire, Last to Lay Down Their Arms," exhibit by the New Mexico National Guard Museum, documents the defense of the Bataan Peninsula in the Philippines by the 200th Coast Artillery, New Mexico National Guard; 9 a.m.-5 p.m. Tues.-Sun., Albuquerque Museum, 243-7255.

June 26-Sept. 6 — Exhibit, "Nature's Invisible World: Artist and Microstructure," Albuquerque artist Alice Charlasch creates beautiful crystalline structures and photographs them under magnification, a total of 28 color photographs are included; 9 a.m.-5 p.m., New Mexico Museum of Natural History, 841-8837.

June 26-Oct. 11 — "Hopi Spirits," exhibit featuring the works of 38 Hopi kachina doll carvers, highlighting their carving techniques and use of detail and color, more than 100 photographs documenting kachina doll making; 9 a.m.-4 p.m. Mon.-Fri., 10 a.m.-4 p.m. Sat., noon-4 p.m. Sun.; Maxwell Museum of Anthropology, 277-4404.

June 26-Jan. 13 — Exhibit, "Dinosaurs, Penguins, and Whales: The Wildlife of Antarctica," collection of 45 oil paintings by California artist William Stout, exhibit includes fossils, videos, an iceberg scene, and a computer simulation about the ozone hole above Antarctica; 9 a.m.-5 p.m., New Mexico Museum of Natural History, 841-8837.

June 26-28 — Festival Flamenco '92: concert of

flamenco dance, music, song, with dancer La Tati and singer Talegon de Cordoba from Spain, Jose Greco, Jose Greco II, Pilar Serrano, Pedro Cortez, La Conja, Dominico Caro, Eva Encinias and Ritmo Flamenco, Pablo Rodarte, Eric Patterson, Juanito Truitt, and Alma Flenmenca; 8 p.m. Thurs.-Sat., 2 p.m. Sun.; Rodey Theatre, 884-099

June 27 — Baila! Baila! International Dance Studio Performance at UNM Continuing Education Conference Center, 1634 University Blvd. NE at 7 p.m.; tickets are \$8; tickets for senior citizens, UNM students, and children (12 and under) are \$5; call 277-4624.

June 27 — Cochiti Drum Making Demonstration by Nate Pecos at UNM, Maxwell Museum of Anthropology, 11 a.m.-3 p.m., free, 277-4404.

June 28 — Festival Flamenco 92 (contact Sonja Montoya, 268-8756, Center of Southwest Culture, Division of Sun Dance Inc.).

July 4 — Spirit '92 Independence Day celebration sponsored by KGGM-TV Channel 13 and hosted by Kirtland AFB; gates open at 11 a.m. with continuous entertainment beginning at 1 p.m.; "Concert in the Sky," the largest pyrotechnic display in New Mexico tops off the evening; helping to celebrate will be: Acoustic Alchemy, Beatlemania, Chris LeDoux, Linda Cotton and Streetlife, Salsa Suite, the Hoffmantown Baptist Choir, and a special performance by the Air Force Tops in Blue; a supervised kids area, an arts and crafts area, and many food and beverage booths will be available.



NOSE JOB — Tips of missiles outside the National Atomic Museum on Kirtland AFB get a finishing coat of paint during the museum's recent renovation program. A construction company employee, Arthur Blea, wields the paint sprayer.