

## Sandia Contributions Could Speed Up Space Travel, Improve Communications

In the highly publicized Strategic Defense Initiative for intercepting enemy missiles, a powerful laser beam could conceivably destroy an enemy target. But when applied to the space program, such a laser might be used for propelling satellites through space or powering electrical plants on the moon.

In another defense program at Sandia, a robotic vehicle can find its own way over dangerous terrain, collecting geological and intelligence data. But a similar rover could be sent to explore unknown worlds such as Mars, by combining the navigation and geologic sensing capabilities with space exploration.

Similarly, high-frequency communications that permit military satellites to transmit ever

---

**“ . . . we are not competing with NASA, but are offering technological alternatives to help NASA accomplish its mission.”**

---

greater amounts of data could also be used to relay information about distant planets, the Earth, or asteroids and moons.

Even nuclear power, frequently overlooked as a serious alternative to conventional chemical rocket fuels, could be used to reduce the duration of a human mission to Mars by more than half. A nuclear rocket could decrease the time needed for the entire round-trip journey to less than a year, be-

### ‘Every Right to Be Proud’

## Bond Allotment at All-Time High

Sandians will invest a record amount this year in US Savings Bonds as a result of last spring’s Bond drive. Allotments for the current year total \$3,349,512, an 8.2 percent increase from a year ago, according to Ray Reynolds (5120), 1990 Savings Bond chairman.

“As usual, the Bond effort received outstanding support from Sandians at all locations — Albuquerque, Livermore, Tonopah, NTS, and Pantex,” says Ray. “That kind of support is appropriate from people at a national laboratory, and employees have every right to be proud.”

The total Bond allotment translates to an average \$33.28 per month per employee, compared to \$31.46 a year ago. About 48 percent of Labs employees are at or above the Bond-a-month level.

Final 1990 Bond drive stats show that 96.4 percent of Sandians now buy bonds. “Historically, Sandia has had a tremendous participation record,” notes Ray. “Obviously, Labs employees know a good deal when they see one.”

### Six 100-Percent Directorates

Six directorates achieved 100-percent participation: 200, 400, 1400, 1600, 3300, and 6500. The “Almost-100 Club” (98 percent or better) consists of 100, 1100, 1500, 2800, 3500, 5200, 6200, 6300, 6400, 7200, 9100, and 9200. Honorable mention for 97-percent-plus participation goes to 1200, 2300, 2500, 7500 and 9300. Org. 6000 takes vice-presidency top honors with a 98.59-percent participation rate.

“Our outstanding campaign results didn’t just happen,” says Ray. “They directly reflect a lot of effort by a lot of folks — including members of the Savings Bond Committee and VP/directorate reps.

“They deserve a round of applause, as do the many Sandians who support our Bond effort each year.”

•PW

cause nuclear power provides a much larger amount of energy for a small amount of fuel mass than do conventional fuels such as liquid oxygen and hydrogen.

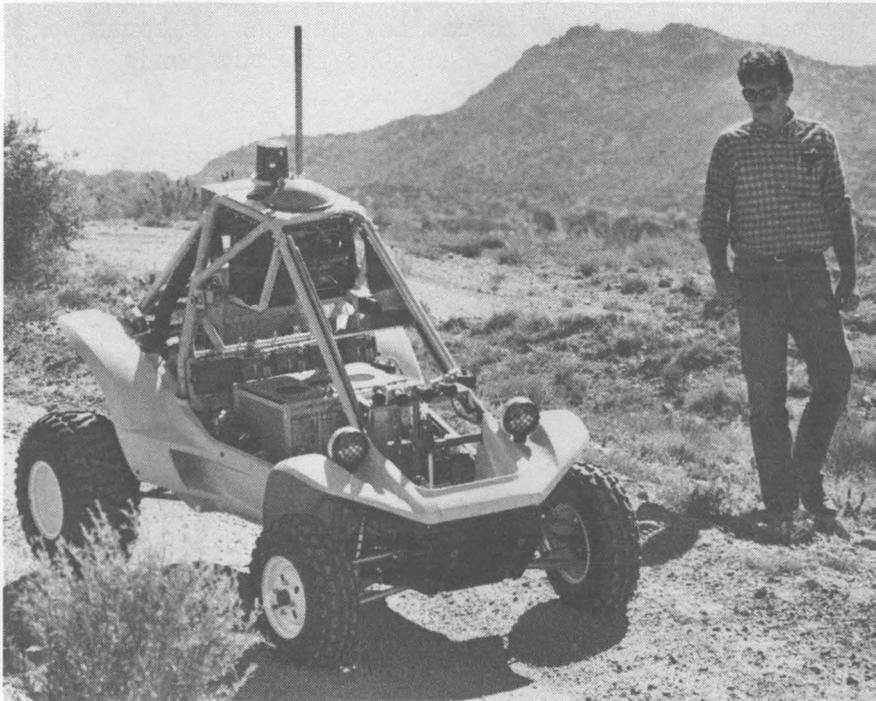
### Collaborating With NASA

These are just a few examples of defense programs that could be applied to space exploration, through a marriage of such technologies with space program needs. Indeed, Sandia representa-

tives are discussing possible collaboration with the National Aeronautics and Space Administration at NASA’s invitation, as part of the Space Exploration Initiative (SEI) endorsed last year by President Bush. Bush’s program envisions participation by national laboratories and private industry in cooperation with NASA.

The President’s program has three primary goals: to build the space station Freedom, to es-

*(Continued on Page Four)*



PETER BOISSIERE (1414) accompanies an all-terrain robotic vehicle on a desert spin. Sandia has provided the robot with computer smarts and other modifications that enable it to skirt rocks, ravines, and other obstacles on its own. NASA is considering the use of robotic rovers in planetary and lunar exploration.

# LAB NEWS

VOL. 42, NO. 14

SANDIA NATIONAL LABORATORIES

JULY 13, 1990

### Sandia Professors Also Named

## Sandia, UNM Form Joint Materials R&D Lab

Although materials-science researchers at Sandia and the University of New Mexico have collaborated in the past, most collaborations have been limited, involving single investigators in the University’s academic departments or in groups such as the Center for Microengineered Ceramics or the Center for High Technology Materials.

Now, the formation of the Sandia/UNM Materials Research and Development Laboratory will give Sandia and UNM staff a central lab facility where they can work together for extended peri-

ods. Industrial researchers can join them for projects of mutual interest.

At a news conference last week, Sandia President Al Narath and UNM President Richard Peck announced formation of the lab, which will be located in the new University Research Park on UNM’s south campus. Its purpose is to promote education in science and engineering and foster technology transfer to industry. A budget of \$570,000 for FY91, funded equally by Sandia and

*(Continued on Page Eight)*



UNM-NATIONAL LAB Professors from Sandia (flanking a Lobo sculpture on the UNM campus) are (from left) John Shelnut (6211), Olden Burchett (9333), Jeff Brinker (DMTS, 1846), Marshall Berman (6517), Ralph Dawson (DMTS, 1144), Mike Forrestal (DMTS, 9123), and Bob Blewer (DMTS, 2132). Not shown: Cliff Mendel (DMTS, 1263).

# This & That

330 Miles of Money – Congratulations, Sandians. We've done it again – set a new record for the amount that we'll invest in US Savings Bonds. We have pledged to buy nearly \$3.35 million in bonds this year through payroll deductions, an 8.2 percent increase from a year ago (see story on page one). With my meager bank account (Are you listening, boss?), I have a hard time relating to millions of dollars, so I did a little "ciphering" to give some meaning to \$3.35 million. If you had that amount in one-dollar bills – nearly 6-1/4 inches long – and laid them end to end along I-40, \$3.35 million would stretch about 330 miles, or from Gallup to Tucumcari and slightly beyond.

All organizational reps, Bond Committee members, and Committee Chairman Ray Reynolds (5120) can take pride in a job well done. Sandia continues to be near the top of organizations nationwide when it comes to Bond participation. Nearly 96.5 percent of Sandians now buy bonds through payroll deductions.

\* \* \*

The Worst Typos – Those of us in the writing and publishing business fear certain typographical errors more than others – the ones where a single wrong keystroke changes a perfectly good word into one that's obscene or otherwise embarrassing. I'm sure the person who typed the following item on a Sandia calendar of events knows of what I speak: "Total Quality Management at the Navel Shipyard." I was going to mention a couple of really bad ones I've seen over the years, but I couldn't figure out how to do that without getting myself in trouble.

\* \* \*

Zipped to New Jersey – Somehow Phil Pelzman's recent Credit Union statement was inadvertently placed into the US mail instead of the internal mail. The Postal Service did what came naturally, I guess – assuming Phil's organization number (7845) to be a zip code number and sent it to Ironia, NJ 07845. The Postal Service there returned the statement, marked undeliverable, to the Credit Union folks, who quickly got it to Phil.

\* \* \*

Don't Ya Be No Armchair Sandian! – It was evident from the last Labs-wide employee communications survey that many Sandians felt improvements were needed – that they didn't have a real say in enough matters or a chance for meaningful input. The Sandia "climate" is definitely changing and giving employees more opportunities for that input. Articles we've published in the past few months make that evident, I hope. The revamped employee Feedback/Suggestion system, the Barrier Busters, Upward Feedback, and the "Brown Bagging with Brass" program all give us an opportunity to have more of a voice about Sandia policies and procedures. Let's take advantage of it.

\* \* \*

A Pontoon Boat Would Be Nice – The problem with being a natural-born smart aleck is that your offspring tend to follow in your footsteps. After returning to the house with a fresh haircut last week, I quipped to my teenager that the barber refused to cut my hair like I requested – cut out all the silver ones and leave the brown ones. "He was just being nice," my kid remarked. "Howzat?" I said. "He didn't want you to be three-fourths bald," he replied. His college fund just may turn into that new boat I've been wanting.

●LP

## Fall TLC Course On Drug-Abuse Prevention

Parents enrolled in Sandia's Total Life Concept (TLC) program will be invited to participate in a parenting skills course this fall that's designed to prevent drug abuse in the family.

The course, which may eventually be offered to all Sandians, was well received by Sandians who participated in two pilot sessions this spring, says TLC coordinator Pete Egan (3330).

During the course — "Parenting Skills for Drug-Free Children" — participants discuss such issues as developing a family position on drugs, teaching children how to say no to drugs, expressing feelings and controlling anger, and strengthening family bonds. The course offers suggestions about how to achieve these goals.

"It's interesting and enlightening," says Pete, "that a recent study involving 15,000 children found that 66 percent of them said they don't use drugs because of their relationship to their parents. An important key to success is to establish that kind of relationship when the children are young and to make them aware of drug dangers at an early age — when they are in kindergarten or early elementary school."

The course includes two joint sessions between parents and children, during which family members do role-playing exercises and discuss such problems as family communication, peer pressure, friendships, feelings, alternatives to drug use, and self-concept.

Course participants will discuss the known risk factors in teenage drug abuse: family history of alcoholism, family management problems, parental drug use, early antisocial behavior and hyperactivity, academic failure and lack of commitment to school, antisocial behavior in adolescence, friends who use drugs, and more.

Jann Levin (3545), Tex Ritterbush (111), and Florence Parnegg (contractor) represented the Labs at the Governor's Substance Abuse Prevention Planning Summit in May. Florence, who coordinates the Medical Directorate's Family Program, says leaders from throughout the State agreed at that meeting that a statewide parent drug-education effort was needed.

"The new TLC drug education course fits right in with this program," says Florence. "It's exactly the type of thing that New Mexico's leaders are recommending."

Employees needing more information about the course or about Sandia's Family Program should call Florence on 4-3993.

## LAB NEWS

Published Fortnightly on Fridays

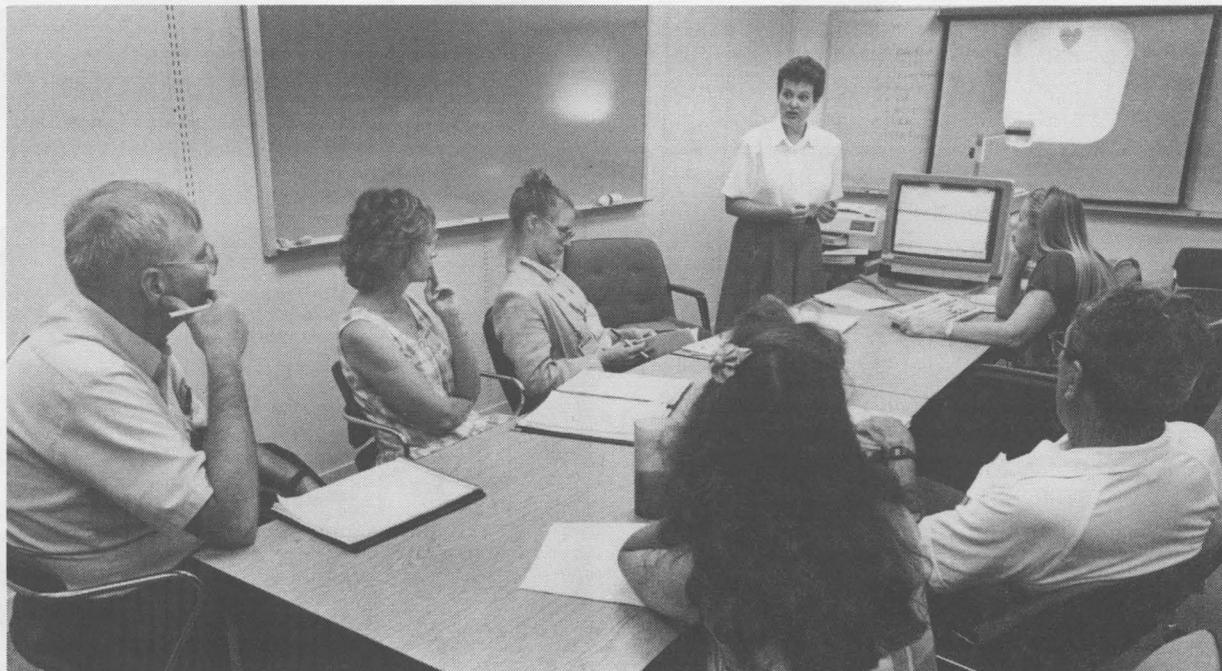
SANDIA NATIONAL LABORATORIES

An Equal Opportunity Employer

ALBUQUERQUE, NEW MEXICO 87185-5800  
LIVERMORE, CALIFORNIA 94550  
TONOPAH, NEVADA  
NEVADA TEST SITE  
AMARILLO, TEXAS

Sandia National Laboratories, a prime contractor to the US Department of Energy, is operated by Sandia Corporation, a subsidiary of American Telephone and Telegraph Co.

LARRY PERRINE, Editor (505/844-1053)  
PHYLLIS WILSON, Assistant Editor (844-7842)  
CHARLES SHIRLEY, Writer (846-5542)  
LINDA DORAN, Writer (846-6888)  
RANDY MONTOYA, Photographer (844-5605)  
MARK POULSEN, Photographer (844-5605)  
JANET WALEROW, Editorial Assistant (844-7841)  
TABITHA JEANTETTE, Assistant  
BARRY SCHRADER, Livermore Reporter  
(415/294-2447; FTS 234-2447)



SANDIANS SHARED their computer skills recently at the annual June Computing Institute, organized by APS for Albuquerque teachers. Teachers may take Institute classes for recertification credit; designed to improve computer literacy, sessions focus on new software and applications and include demonstrations and hands-on activities. Here, Patricia Newman (9110, standing) explores the ins and outs of desktop publishing with a group of Institute participants. Other Sandia instructors were John Larson, Kim Denton-Hill (both 3142), Len Malczynski (3411), and John Abbott (3213).

**Sandia Technique Attracting Wide Interest****Photofragment Imaging Shows How Molecules Break Up**

Scientists use photochemistry to initiate chemical reactions in the laboratory just as the sun initiates reactions in the atmosphere. Both the formation of smog and the destruction of the ozone layer are photochemically induced. The study of the breakup of molecules by light — photodissociation — can also shed light on the reverse process, the collision of two molecules.

Researchers at the Combustion Research Facility have developed a new technique, called

**Both the formation of smog and the destruction of the ozone layer are photochemically induced.**

photofragment imaging, to study photodissociation. The technique should prove highly useful to scientists working to understand complex photochemical reactions, says Dave Chandler (8353), one of the originators.

"It's more efficient than earlier methods," says Dave, "because a single measurement provides several kinds of information — such as fragment speeds and angles — instead of just one kind of information. We get data in hours, rather than weeks. Also, the apparatus is smaller and considerably less expensive than that used for the earlier methods. The trade-off for these advantages is that we sacrifice a little resolution."

**2-D Images Yield 3-D Data**

Photofragment imaging employs lasers, imaging technology, and a host of associated electronics to quickly obtain information about how molecules split up into smaller fragments (see "Fragments Make Blips on Screen"). Researchers obtain a two-dimensional pattern of the fragments generated by a photodissociation event and calculate their previous three-dimensional distribution — as if they

**Supervisory Appointment**

DONA CRAWFORD to Manager of Computation Department 8230, effective June 16.

Dona joined Sandia Livermore in 1976, initially working on numerical analysis and applications programs in the Computing Department. Later she became a systems analyst and manager for the VAX computer system, teaching VAX user courses and serving as a consultant on all the computer center's systems. She led the Cray Time-Sharing System (CTSS) project in

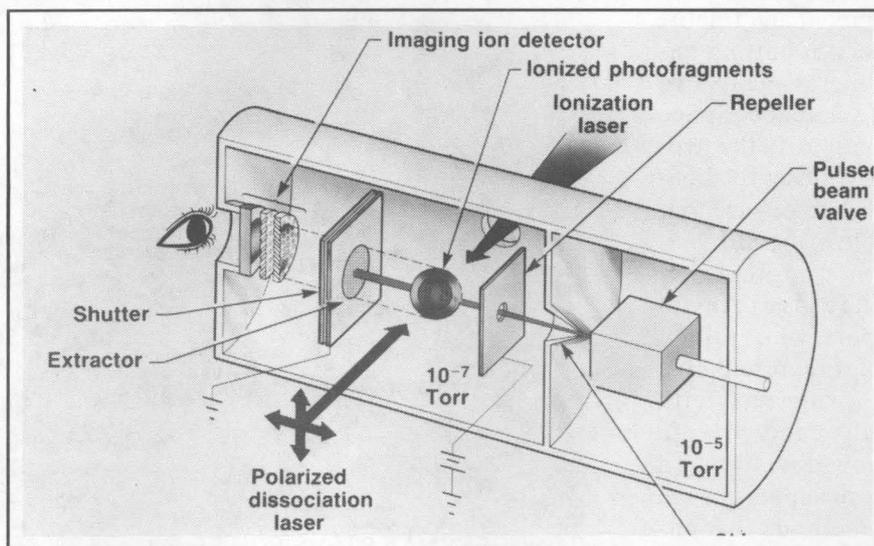


DONA CRAWFORD

Livermore. She was promoted to Supervisor of Operating Systems Div. 8235 in January 1985.

She has a bachelor's degree in math from the University of Redlands, an MA in German from Middlebury College's campus at the University of Mainz in West Germany, and an MS in operations research from Stanford University through Sandia's One Year on Campus (OYOC) program.

She and Bob Dibble have two children, Julia, 9, and Joshua, 7, and live in Livermore. Dona enjoys classical piano but devotes much of her spare time to her children's activities such as Brownies, Cub Scouts, and youth soccer.



**PHOTOFRAGMENT IMAGING** — Conceptual drawing shows the technique used by Sandia researchers. Although the images can be seen with the eye, they're normally recorded with an electronic camera.

looked into the apparatus a short time after the dissociation event and saw the individual fragment molecules.

Among the initial experiments using the photofragment imaging technique was the investigation. (Continued on Page Eight)

**When Laser Hits Molecular Beam****Fragments Make Blips on Screen**

Photofragment imaging involves first cooling molecules by mixing them with helium and expanding the mixture through a nozzle into a vacuum. A narrow beam is formed by shooting the mixture through a skimmer at supersonic speed (see illustration). The beam contains molecules with a well-defined velocity, cooled to below 15 K (about -260°C, or -440°F). At this temperature, molecules are in their lowest-energy vibrational and rotational states.

In the high-vacuum chamber, the molecular beam is intersected at right angles by a polarized laser beam; that is, the electric field of the laser's light is oscillating in one direction. Only molecules whose atoms are in a particular orientation will absorb energy from this light beam and break apart (dissociate). Dissociation of a molecule produces two fragments — in the case of methyl iodide, iodine atoms and methyl molecules. Depending on how the energy from the laser is absorbed and shared, these fragments may be moving quickly (corresponding to a small amount of energy in internal states of the fragment — vibration, rotation, and electron excitation) or moving slowly (corresponding to larger amounts of energy in internal states).

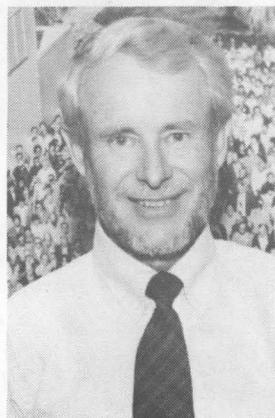
About 10 billionths of a second after the

dissociation event, a second laser beam intersects the fragments. The photons of the beam selectively — depending on the fragment's vibrational and rotational energy — remove an electron from some of the methyl molecules, converting them to positively charged ions. These molecules, now with a positive electrical charge, are accelerated by high-voltage grids onto a position-sensitive detector. Each charged molecule generates a million electrons, easily seen as a burst of light on a phosphor screen. A typical measurement integrates data from laser shots occurring 10 times a second for about 10 minutes.

Though the image produced by the cloud of ions can be seen with the eye, normally it's recorded with an electronic camera and digitized for use with a computer. The image is a two-dimensional projection (like a shadow) of the methyl fragments. Analysis of the images involves inverting the two-dimensional picture in such a way as to reconstruct the original three-dimensional distribution of the fragments. "This quickly yields a wealth of information about the dissociation process," says Dave Chandler (8353), one of the Sandia researchers who pioneered the technique.



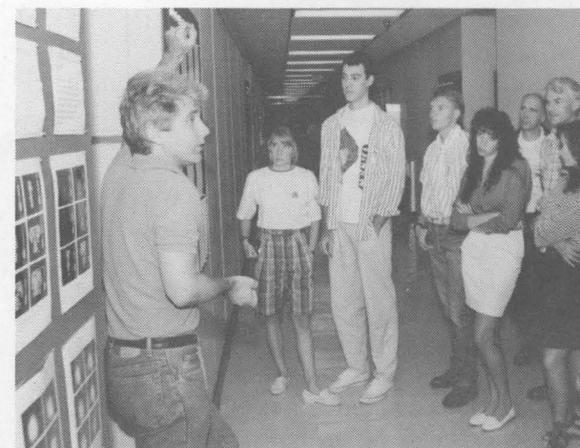
SANDIA LIVERMORE NEWS

**Recent Retirees**

Bob Graham (8271)



Jean Kamp (8161) 30



CHEMISTRY STUDENTS from Las Positas College recently toured the Combustion Research Facility. Here, Joe Durant (8353, left) answers questions outside his chemical-kinetics lab. Other participating Sandians were Frank Tully (8353), Rick Trebino (8354), and David Chandler (8353).

**Congratulations**

To Lorena (8523) and Dave Petersen, a son, Alexander Scott, June 23.

*(Continued from Page One)*

## Space Travel

establish human colonies on the moon, and finally, to fulfill the long-awaited dream of putting humans on Mars. New Mexico Congressman Steve Schiff, a member of the House Science, Space and Technology Committee, supports the program and is working to cultivate a closer relationship between Sandia and NASA to ensure that New Mexico has a significant role in the SEI.

John Bertin (400), a former engineering professor at the University of Texas at Austin and NASA aeronautics expert who joined Sandia last July, is Sandia's chief representative in formulating cooperative programs with NASA, DoD, other DOE labs, and private industry. He says Sandia is now developing a mission statement for the Labs in support of the SEI and exploring operating methods that encourage specific technical payoffs.

"John's assignment in coordinating a lab-wide strategic initiative is the first of such activities in the Laboratory Development Directorate," says Gerry Yonas (400).

Potential Sandia contributions to the prosperity and well-being of the nation through the space program are in manufacturing technology, communications, sensors for monitoring the Earth's atmosphere and resources, energy, and nuclear technology, says John. Medical applications are conceivable as a result of developing sensors to monitor the bodily functions of astro-

---

**"John's assignment in coordinating a lab-wide strategic initiative is the first of such activities in the Laboratory Development Directorate."**

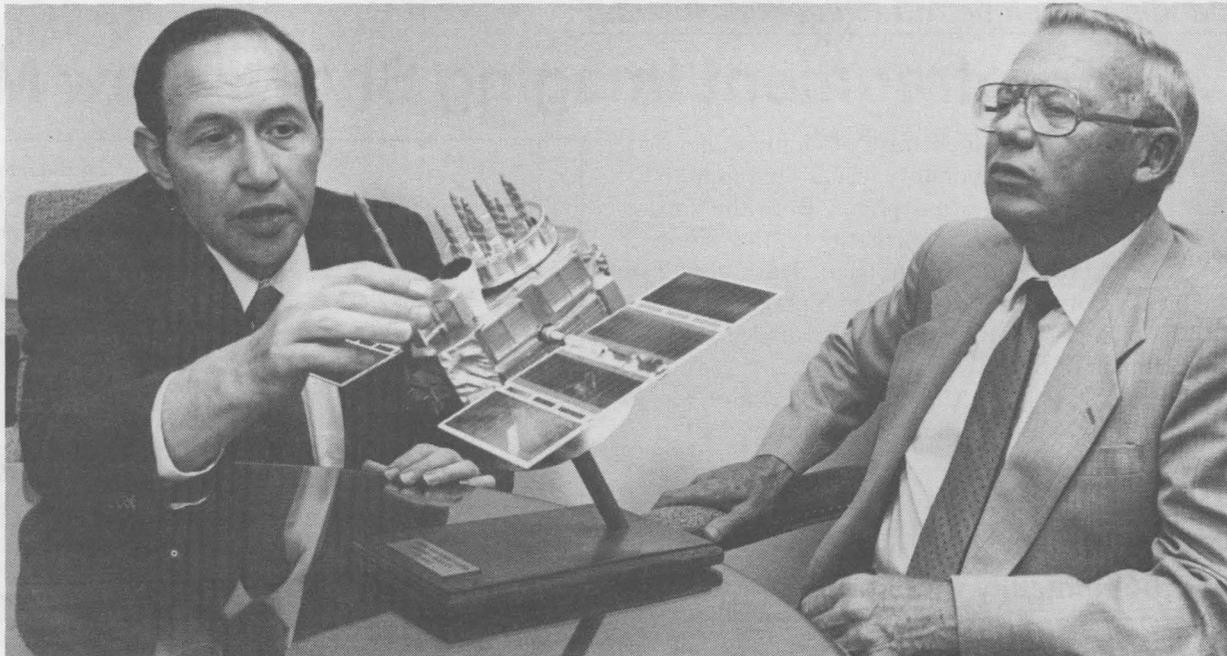
---

nauts. Similar technologies could be used to monitor the health of elderly or non-ambulatory people to help doctors make critical decisions about treatment.

Manufacturing technology could benefit from the use of robotics and strong but lightweight materials to construct the space station. Nuclear power applications could play major roles in space transportation and space power, while also producing technologies of use on Earth.

Contributions to NASA missions are not new at Sandia. In the past, nuclear weapon research has led to such advancements as radiation-hardened microelectronics that can withstand the radiation belts of Jupiter. (Standard microelectronics can be destroyed by strong radiation.) Two thousand radiation-hardened computer chips designed at Sandia are now on board the Galileo spacecraft, en route to the giant planet.

Sandians have helped design a plethora of sci-



CONGRESSMAN STEVE SCHIFF, left, and Bill Snyder (6900) discuss a Global Positioning System satellite, for which Sandia designed the optical sensors and data processing system. The technology that went into developing the satellites, which monitor nuclear test bans and provide positioning data to navigators, is applicable in other space programs as well. Congressman Schiff is working to cultivate a closer relationship between Sandia and NASA to ensure that New Mexico has a significant role in the Space Exploration Initiative.

entific instruments for space missions, such as x-ray and gamma-ray spectrometers.

"The point is, we are not competing with NASA, but are offering technological alternatives to help NASA accomplish its mission," says Bill Snyder, Director of Select Initiatives Directorate 6900 since July 1. Bill is chairman of Task Force '90, a group of 14 department managers at Sandia who meet regularly to brainstorm and come up with ideas that could be of benefit to NASA. He is also a member of Congressman Schiff's local advisory committee on science and technology issues.

One of the jobs of the task force is to review the long-term benefits of the 30-year space initiative to the quality of life and to national competitiveness.

### Mission to the Red Planet

If humans are ever to set foot on Mars, as envisioned in the President's Space Exploration Initiative, they will have to figure out a way to survive the rigorous, 240-million-mile journey through a zero-gravity environment. An absence of gravity sometimes wreaks havoc on the human body, affecting pulmonary functions and bone mass, among other things.

One way to minimize the hazards is simply to shorten the duration of the trip. Current technology, using conventional chemical fuels that would propel a rocket at about 71,000 mph relative to the sun, would require about 2½ years for the round-trip journey to the Red Planet. With nuclear energy, however, that time could be reduced by more than half, to less than a year for the whole mission.

"The way I look at it, I'm not sure that a human can live in a Volkswagen for 2½ to 3 years,"

says Bill, referring to the small size of the quarters where astronauts would spend their time.

### Lasers and Nuclear Power in Space

High-powered lasers were the subject of a special NASA workshop last year at the Langley Research Center in Virginia. A report on the workshop discusses the potential of using lasers to transmit power from Earth to orbiting satellites, from one spacecraft to another in orbit, or from an orbiting spacecraft to a power station or a lunar rover on the surface of the Moon.

The key to using such technology is converting the laser beam to electricity. This can be accomplished with a solar collector, which looks a lot like a satellite dish that is covered with photovoltaic cells that are sensitive to the particular laser wavelength, explains Jack Walker, Manager of Nuclear Technology and Applications Development Dept. 6460 (see "Lasers Could Help Send People to Mars," page five).

Nuclear energy could be used to get spacecraft to their destination more quickly, or to produce power for years at a time at remote outposts. Lou Cropp (6472) heads a group that is studying the safety and technology associated with nuclear-powered rockets and nuclear power sources capable of producing electricity for lunar bases.

Nuclear power could also be a considerably cheaper rocket fuel than conventional chemical fuels, because it requires only one combustible gas, in this case, hydrogen, as opposed to the much heavier fuel weights of both oxygen and hydrogen carried by the space shuttle.

A nuclear reactor-powered rocket heats gas directly by passing it through a reactor core, explains Jack. The reactor itself is housed inside a cylinder, while cold hydrogen is passed through it, heated, and blown out a nozzle in the back, propelling the rocket.

Nuclear fuel is lighter than traditional chemical fuels, making it less expensive to launch. (Depending on several factors, the weight of a nuclear engine and fuel might be only one-tenth that of a conventional rocket engine and fuel.) It currently costs about \$80,000 to put one kilogram of material on the Moon and \$800,000 to put one kilogram of material on Mars using conventional chemical fuels, says Jack.

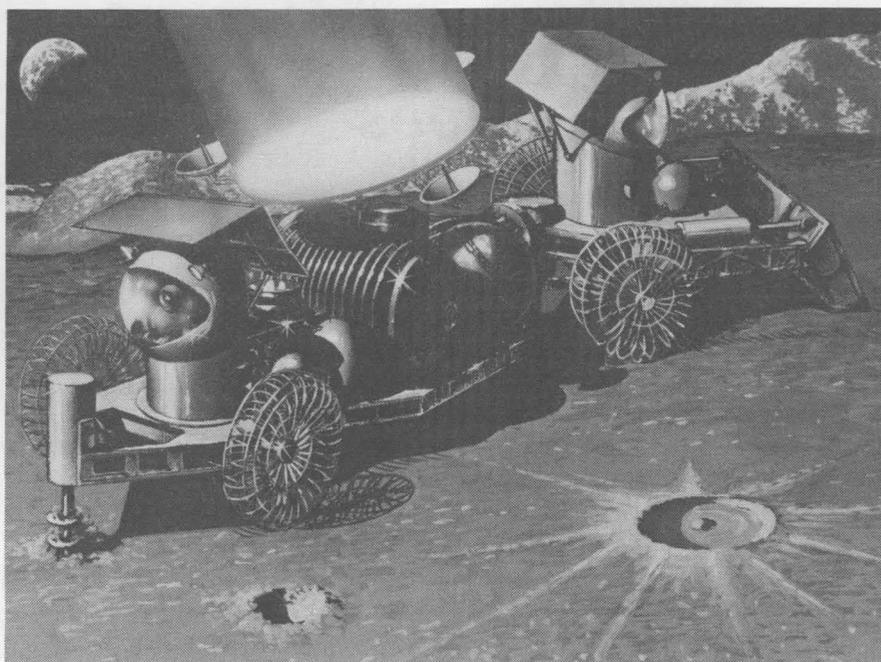
If nuclear energy alternatives are used, Sandia can offer its years of safety and fuels expertise in developing such technologies.

### Increasing Data Transmission Rates

Sandia is also studying ways to improve space communications. Currently, leading-edge research is focused on developing technology for ever-higher microwave frequencies, but it is conceiv-

*(Continued on Next Page)*

IN THIS NASA drawing, laser power is beamed to photovoltaic converters on a lunar rover that is capable of moving, coring and pushing soil, communicating with Earth, and conducting chemical analyses.



## Lasers Could Help Send People to Mars

"The use of lasers in space is an important technology, and we see a marriage of the nuclear-reactor driven laser technology that we're developing and the requirements for the use of this in space," says Jack Walker (6460).

One scenario for exploring Mars is to launch a laser-carrying satellite and put it into orbit around the planet, then send astronauts to Mars after the laser is in place. The satellite laser, when activated, would then beam light energy to surface receivers on Mars. The receivers could convert the light energy to electricity.

Power will be needed for heating, for manufacturing oxygen from frozen water buried beneath the surface, and for returning to Earth.

"This has never been done before, but it tells you what the potential is, and why NASA, in its long-term planning, is interested in this. As a DOE lab, we can help provide NASA with these capabilities," notes Jack, adding, "We are very optimistic that we know how to build such a laser."

Lasers similar in concept have been designed at Sandia for the SDI. Just as it is conceived that a laser weapon for SDI could track and shoot down an enemy missile, a laser beam could conceivably

be used to track and power a spacecraft. Since a laser beam directs light along only one vector, as opposed to a flashlight, which dilutes light over a large area, a laser can concentrate light energy over fairly long distances, such as from Earth to an orbiting satellite or even from Earth to the Moon, says Jack.

Sandia is currently refining technology to use a nuclear reactor to pump a laser. In the early 1970s, Sandia received the first patent for pumping a laser directly with nuclear energy, notes Jack, rather than first generating electricity to produce a current to pump the laser.

To produce a laser from nuclear power, the kinetic energy released by uranium atoms that split in two during nuclear fission is used to directly ionize a laser gas by exciting individual molecules in the gas. No intermediary electricity-producing steps are necessary.

By the end of this year, Sandia researchers expect to demonstrate high-energy laser technology in the Annular Core Research Reactor, a facility used to study the physics of reactor-generated laser light.

The ACRR was built to study nuclear reactor safety and a wide range of radiation effects.

The reactor is being used in the FALCON (Fission-Activated Laser Concept) project, in which Sandia scientists and engineers are designing a laser of 1 million watts (1 megawatt). Bigger lasers are feasible, and NASA eventually will probably need a power source of 40 to 50 megawatts, says Jack, who hopes to be doing experiments to demonstrate the technology by the year 2000.

Laser-energized propulsion has the benefit, says Jack, of requiring only hydrogen, the lightest element, as a fuel, as compared with both hydrogen and oxygen, which are mixed together to achieve combustion on the space shuttle.

If the reactor were used to power a laser that would in turn produce electricity in an ion rocket thruster (which uses electrical power to create a stream of ions that move at high energy out the back of the rocket), it would not be necessary to house the reactor on the same spacecraft with the astronauts. To minimize safety hazards, the reactor could be housed on a separate spacecraft, and the laser generated by the reactor could beam power to solar collectors on the spacecraft carrying humans, says Jack.

### (Continued from Preceding Page)

able that one day, even microwave communications will be replaced by laser communications to allow more data to be packed into the same transmission, says Ted Wheelis (6472).

Sandia Albuquerque is now developing a 60-gigahertz microwave transmission system in conjunction with Martin-Marietta Space Systems in Denver for SDI. Existing satellites typically communicate at frequencies of 20 and 44 gigahertz. Ted, project manager of the 60-gigahertz program, predicts those frequencies eventually will be increased to even higher frequencies for NASA. By comparison, citizens band radios operate at around 26 megahertz.

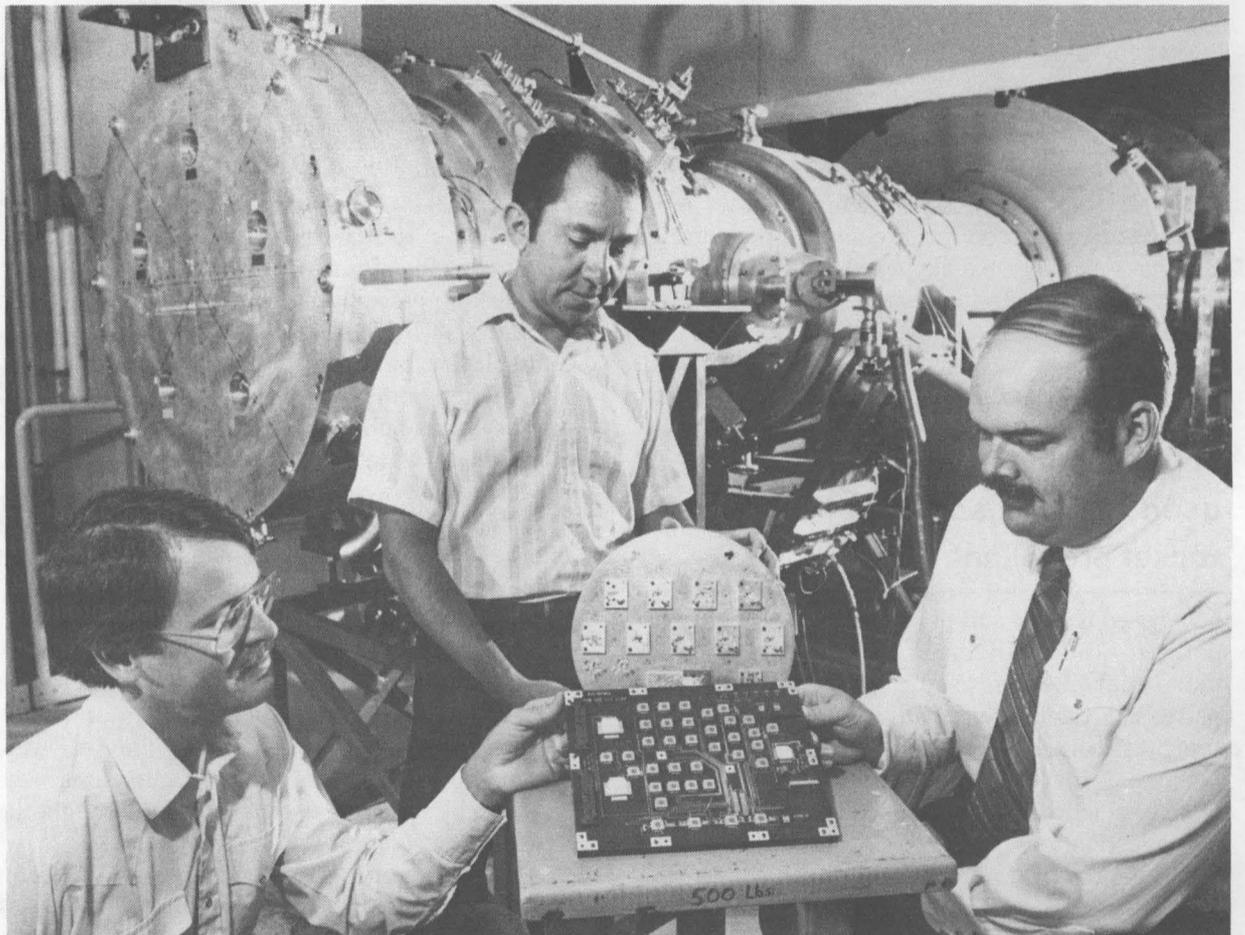
A military advantage of the 60-gigahertz system is that it can't be jammed from the ground, says Ted. A space exploration advantage is that the higher-frequency signal can relay a lot more information in the same amount of time. This is a matter of key importance to NASA, particularly in situations involving transmissions between Earth and other planets. Though it is not possible to send a signal any faster than the speed of light, it is possible to send more information in a shorter time interval by reducing the wavelength of the signal that is being transmitted, allowing an increase in data rates. This would be particularly important for high-resolution video signals.

The chief barrier to developing higher-frequency communications, says Ted, is that as frequency increases, the characteristic linear dimensions of electronic devices decrease. This decrease approaches existing fabrication technology limits. In layman's terms, the wires and components must be of the appropriate size in order to guide the signal so it doesn't get lost.

In the 60-gigahertz program, Sandia is providing radiation-hardening and testing expertise and building a prototype transmitter, while Martin-Marietta is building a receiver. The whole system will be ready for flight testing and radiation testing by 1992.

### Sending Robots Ahead of Humans

An example of a robot being developed at Sandia that could be used in space exploration is a rover that can navigate its own way through hostile environments and assess the geologic makeup of hazardous terrain. Capable of skirting rocks, bypassing ravines, and avoiding other obstacles, the vehicle could be used to explore unfamiliar planets like Mars.



EXAMINING ELECTRONIC COMPONENTS tested in the Hermes III gamma-ray facility are (from left) Dave Sanderlin (2346), Marcelino Armendariz (2175), and Ted Wheelis (6472). The components, including the circular Radiation Plate Microwave Composite and the square-shaped Direct Digital Synthesis Breadboard, are being used in a project to increase the data rates of satellite transmissions to frequencies of 60 gigahertz.

"And since no one has been there yet, we don't know all the obstacles that are going to be in the way," says Pat Eicker, manager of Computer Sciences Dept. 1410.

The chief difference between Earthbound and space-exploring robots, notes Pat, is that space robots cannot be remotely controlled by a human operating a joy stick because of the time delay — up to 40 minutes between Earth and Mars — in receiving and sending radio signals.

Such a robot would have to be equipped with a system for computer vision, sensors such as ground-penetrating radar for studying geology, robotic arms for planting sensors in the ground and collecting soil samples, and computer smarts for recognizing and avoiding a hazard when one is encountered.

Sandia is already developing those technologies, not only for the military applications, but for robots that could map and remove radioactive

waste from underground storage tanks in an environmental cleanup project of the DOE.

### Other Collaborations With NASA

Sandia is already working on three sensor projects with NASA that predate the President's space initiative.

Those projects include two charged-particle analyzers designed at Sandia that will be launched in October aboard the Ulysses spacecraft to study the poles of the Sun, and an x-ray polarimeter scheduled for launch on a Soviet satellite in 1993 in a joint project with the Soviets, Lawrence Livermore National Laboratory, Columbia University, NASA's Marshall Space Flight Center, and other nations.

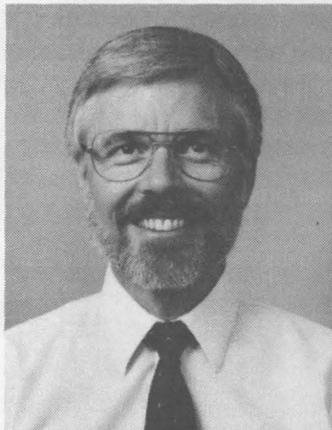
Sandia is also assisting in the design of an optical instrument for a European mission called the X-ray Multi-Mirror Mission, planned for launch in 2000. ●LD

**'A Roaring Success'**

# Sandian Assists Seattle Arson Investigation

"Fire for hire" often paves the road to fraudulent insurance claims — and is alleged to be the motive behind eight unique arson fires in Seattle, Wash., and environs dating back to 1984. Earlier this year, Seattle Fire Chief Claude Harris requested Ned Keltner's (7537) assistance in conducting and analyzing a test to help determine what kind of high-temperature accelerant might have been used to fuel the seemingly related Seattle-area fires.

"What made the fires different from 'normal' arson blazes," says Ned, "was their extremely high heat, which broke concrete floors into chunks, buckled and melted steel and cast iron, and created intense white flames. Also, the buildings collapsed much sooner than expected, which led to the deaths of two fire fighters — one in Seattle and one in Spokane."



**NED KELTNER**

It's suspected that the same arsonist was involved in all the fires because of their similarities. "All the buildings set afire were large structures with limited fuel sources inside," Ned adds. "They weren't likely to become flaming infernos within a matter of seconds

if conventional arson techniques had been used. But that's exactly what happened."

The unusual circumstances — and especially premature building collapse — point to some unknown fuel that was used to accelerate the fires, Ned notes. "It's speculated," he says, "that the stuff

**"It's speculated that the stuff being used is some sort of a home-brew rocket propellant."**

being used is some sort of a home-brew rocket propellant — an oxidizer mixed with a powdered metal fuel like that used in rockets. It stays in place, and water has very little effect on it." Identifying the fuel (or fuel mixture) and figuring out the techniques involved in its use were the goals of a team of scientific experts assembled to help with the investigation.

A major effort of the team was replicating, on a relatively large scale, the fast-spreading, extremely hot fires that have been part of the Seattle

scene for about six years and that were similar to some other recent western-US fires in Nevada, Oregon, and northern California.

The Seattle Fire Department asked Ned to provide measurement and data analysis techniques for the fire test (see "From ASTM Committee"). "They asked me what kind of equipment I'd need," recalls Ned. "My needs were fairly simple: I told them I could use a couple of steel plates and a piece of sheet metal to make some 'slug' calorimeters [instruments that heat uniformly to determine heat fluxes during a fire]."

The test burn involved torching a clothing store, previously scheduled for demolition, in a Seattle-suburb shopping center. Beforehand, scientific experts — including lead investigators from Lawrence Livermore National Laboratory and Weyerhaeuser Corporation's R&D Technical

**The building was pushed through "flashover" — the point at which all combustible items inside the building are on fire — just 110 seconds after ignition.**

Center — installed sensing and recording devices to measure temperatures, heat transfer, oxygen reactions, carbon monoxide levels, and other fire characteristics during all stages of the fire.

The fuel mixture concocted by team members from Rocket Research Inc. and Machine Design Engineers Inc. (both of Seattle) was placed in five-gallon paint buckets around three support columns in the building. (The fuel content was undisclosed, but a Seattle Fire Department official, quoted in the local paper, described the mixture as "exotic chemical compounds, though the components were not.")

"The test was a roaring success," Ned reports. "The fuel mixture, once ignited [remotely], created intense heat quickly: approximately 4000°F, about twice as intense as your typical house fire."

The 250-ft. by 125-ft. building was pushed through "flashover" — the point at which all combustible items inside the building are on fire — just 110 seconds after ignition, and the structure was burning end to end in approximately three minutes. About 100 fire fighters from the Seattle area were standing by to extinguish the fire and brought the flames under control within 20 minutes.

"Investigators agreed that the test did a credible job of replicating the arsons under investigation," says Ned. "Damage patterns were similar to

## From ASTM Committee To Arson Investigator

Indirectly, Ned Keltner's (7537) membership on the American Society for Testing and Materials' Fire Standards Committee is what led to his becoming involved in the Seattle arson investigation (see main story). Two of Ned's colleagues on the committee — Harry Hasagawa of LLNL and Jim White of Weyerhaeuser Corp — were lead scientists in the Washington state effort; they suggested to Seattle Fire Department officials that they contact Ned for assistance.

He was asked to provide measurement and data analysis techniques for the fire test. Ned's in the business on a regular basis; he supervises the Thermal Test and Analysis Division — part of the Coyote Canyon Test Complex — which specializes in measurement techniques that define thermal environments, as well as analyses of temperatures and heat fluxes that occur during a fire. Division activities include transportation-accident simulations involving fire tests on shipping containers such as TRUPACT-II.

those in the previous fires, and the collective belief about the arsonist using a form of rocket propellant gained credibility. Everyone said it was the 'fastest' fire they'd ever seen.

"Probably the thing of most value resulting from this test is information that will help fire fighters recognize this type of fire and modify their fire-fighting techniques to help prevent injuries or deaths," Ned continues. "For example, holes would usually be punched in the roof of a burning building to vent the fire; however, in fires of this type, fire fighters would not get on the roof because rapid flashover — and roof collapse — is likely to occur."

### Training Film

The Seattle Fire Department will document a video of the test and develop a training film for fire fighters. Chief Harris, Ned says, plans to make the film available to fire departments around the country. The film will also help arson investigators detect similar fires during on-scene investigations.

Ned's division and Fluid Mechanics and Heat Transfer Div. III 1513 plan several follow-up activities. *(Continued on Next Page)*



PHOTO AT LEFT shows fuel mixture burning around building support posts, about 40 seconds after ignition in the Seattle test fire. Note layer of hot smoke

building up at the ceiling. In photo at right, some two to three minutes after ignition, the building — by now a raging inferno — burns end to end.

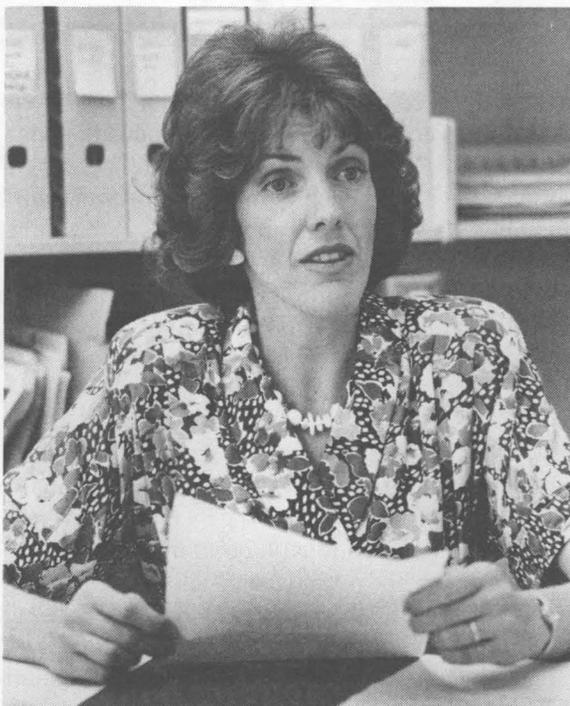
## Joan Woodard Named New Director

Joan Woodard, Manager of Materials Characterization Dept. 1820, has been named Director of Environmental and Manufacturing R&D Programs 6600.

"Directorate 6600 is responsible for developing and managing new programs at Sandia in the areas of improved intelligent manufacturing and environmentally conscious manufacturing, recycling, and treatment technology," says Joan. "The directorate, though initially containing primarily program management and development functions with a small element of research and development, should grow into a strong role in both program management and technology development. Technology development is focused primarily on prototype hardware development and demonstration and will draw heavily on R&D organizations throughout the Labs."

Joan began her Sandia career at Livermore in 1974 as a member of the Systems Studies Division, where she helped analyze solar thermal systems. She continued that work in the Solar Energy Technology Division, and also worked on technical management and design evaluation for the Barstow Solar Central Receiver pilot plant. Later, she contributed to the systems analysis of solar hybrid and repowered plants.

She next joined the Combustion Applications Division, where she researched auto-ignition prop-



JOAN WOODARD

erties of synthetic fuels. Joan was promoted to Supervisor of the Solar Programs Division in 1982. Her work there was in long-range planning and assessment for the DOE Solar Thermal Technologies Division.

In 1984, she transferred to the Materials and Processes Division, which provided materials support to the weapon program and conducted research in modeling metal-forming processes. Joan established an organic composite materials program that offered a new technology for advanced engineering applications. The Materials and Processes Division became the Chemistry and Advanced Materials Division, with a role in materials support for the SRAM II (Short Range Attack Missile) and Strategic Defense Initiative. In December 1988, Joan was promoted to Manager of Materials Characterization Dept. 1820 and moved to Albuquerque. In this position, she managed the Labs' centralized materials and chemical analyses capability and developed new programs in Directorate 1800 that focus on waste minimization and preventing environmental problems.

Joan has a BS in applied mathematics from the University of Missouri at Rolla, an MS in engineering economic systems from Stanford through Sandia's OYOC (One-Year-On-Campus) program, and a PhD in mechanical engineering from the University of California at Berkeley through Sandia's Doctoral Study Program (DSP).

She enjoys skiing, camping, and hiking. She and her husband Jim (2140) have two children and live in the NE Heights. ●JW

## feed iiback

*Q. Sandia recently instituted a three-level MTS system to provide "a unified and visible career path" and to provide flexibility in hiring bachelor's degree people at the MTS level. Where do bachelor's degree STAs fit into this? I've discussed this with several supervisors in the directorate, and it's apparent that they are as confused as I about this. One supervisor went so far as to say that STAs have fallen into a hole and are "dead in the water" at Sandia.*

*If Sandia is indeed ignoring its experienced, bachelor's-degree STAs while it hires those with less experience, it seems Sandia is saying that Labs experience decreases the STAs' value as employees.*

A. Sandia's basic philosophy is that each employee's career should progress commensurate with his/her demonstrated abilities. The recently changed MTS guidelines describe ways to move through the MTS ranks, i.e., SAT to DMTS. STAs can be reclassified as MTSs when they have shown they are consistently doing professional-level work. It's also expected that STAs will have

either bachelor's degrees or experience equivalent to it and will have high performance ratings. Thus, no current STA (regardless of educational attainment) is "dead in the water" in terms of career growth. The ultimate decision for reclassification is made by each vice-president.

An individual with a bachelor's degree may be hired either as an STA or MTS. The job, not the degree, determines the individual's classification. We anticipate that STAs who are reclassified to

MTS will experience future success because they have shown the ability to perform/compete at the MTS level.

Sandia wants to maximize the contribution of every employee and will provide opportunity for upward movement. If your supervisor is unable to describe the reclassification process with you, we'll be happy to meet with you and talk about the process.

Ralph Bonner — 3500

*(Continued from Preceding Page)*

### Arson Study

ities related to the Seattle investigation:

- Testing at Sandia's Radiant Heat Facility, and other tests using small solid-propellant fires to improve understanding of how building structures respond to very intense fires;
- Using fire computer models to better understand the results of the Seattle fire test, and to perform "what if" studies of how the arsons are initiated;
- Computer analyses of various thermal sources, ranging from those involving commonly available materials to those using more exotic ones;
- Documenting information developed in the Seattle test fire and at Sandia for use by investigators in the Seattle Fire Department and other law enforcement agencies; and
- Planning for a much larger test fire in FY91. ●PW



WIND ENERGY Research Div. 6225 recently gave a tour of the Vertical Axis Wind Turbine (VAWT) Test Bed in Bushland, Tex., as part of a tech-transfer initiative. Here, 6225 Supervisor Henry Dodd (right) talks with Lee Richartz of Leema Energy Resources, Inc., a Tiburon, Calif., firm. The tour was included in a day-long workshop for members of industry, who were invited to explore a partnership with Sandia in commercializing a VAWT. The VAWT Test Bed, 50 meters high, is visible for miles in the plains near Amarillo.

(Continued from Page Three)

## Photofragment Imaging

tigation of the photodissociation of methyl iodide into methyl and iodine fragments. This process, a much-studied problem in physical chemistry, served as a benchmark for evaluating the technique.

"We watch how the individual methyl iodide molecule falls apart after it absorbs a photon, and we learn how the energy of the photon is shared among the resulting fragments," explains Dave. He says that results show photofragment imaging to be a valuable tool for studying the dynamics and microscopic details of photodissociation.

The direct output of photofragment imaging is a set of "pictures" — two-dimensional images of the spatial distribution of the fragments. By analyzing the images, researchers deduce the details of the fragmentation process.

Four kinds of information come from a single measurement: the strength of the chemical bond of the intact "parent" molecule, the amount of rotation of the parent molecule during dissociation, the internal energy of each fragment, and the velocity distribution of the fragments. Moreover, this information is obtained for a selected rotational and vibrational state of the photofragment.

### Studying Other Molecules

The Sandia researchers are applying photofragment imaging to the study of the photochemistry of other molecules such as acetylene and brominated hydrocarbons as well as working on improvements to the system. According to George Fisk, former supervisor of Combustion Chemistry Div. 8353 (now on temporary assignment at DOE headquarters in Washington), "The technique is also attracting interest in other research centers studying the applicability of photofragment imaging to reactions where two molecules come together and produce products."

Dave says photofragment imaging is already in use at Cornell University in the laboratory of Paul Houston, who collaborated with Dave on the initial "proof of principle" experiments. Other research centers studying problems in photochemistry are also beginning to use it.

Dave's interest in photochemistry started when he, postdoctoral fellow Tom Spiglanin, and Bob Perry (former Sandian) became involved in measuring the bond strength of HNCO (isocyanic acid). Bob had found that when HNCO was added to exhaust gases at elevated temperatures, it reacted with the nitrogen oxides to clean the exhaust (LAB NEWS, Dec. 19, 1986). To model this process accurately, the researchers had to know the heat of formation of HNCO. Previous measurements of the bond strength conflicted with each other and with theory. Dave and Tom were able to measure the velocity of the CO fragment after photodissociating the HNCO with a one-dimensional velocity measurement technique pioneered by Houston and others. This type of experiment ultimately led to the development of the two-dimensional imaging technique.

### Light on Fossil Fuels

"There's still much to learn about the way molecules dissociate," notes Dave. "Understanding these processes will also aid scientists studying reactions that occur in the atmosphere among the by-products of the burning of fossil fuels."

Other collaborators on the photofragment imaging project included David Parker of UC Santa Cruz; John Thoman, Jr. of Williams College; and Maurice Janssen and Steven Stolte, both from Catholic University, The Netherlands. Technical support at the CRF was provided by Mitch Williams (8283) and Mark Jaska (8353). The work is supported by a grant from the DOE Office of Basic Energy Sciences, Division of Chemical Sciences. ●

(Continued from Page One)

## Sandia and UNM Collaborations

UNM, will provide facilities for a staff of approximately 30.

"Advanced materials are of vital importance to the nation's economic health and to industrial competitiveness," says Al. "Sandia's scientists and engineers have long been recognized for their work in materials science and engineering. Recent emphasis on materials science at the University of New Mexico has set the stage for a major increase in collaborations that will bring important benefits to the nation and to New Mexico."

### Practical and Logical Arrangement

"This is a practical and logical arrangement," adds Peck, "not only for UNM and Sandia, but also for New Mexico. When the state's major university and a prominent national laboratory pool their resources, everybody stands to benefit."

Paul Risser, UNM vice-president for research and interim vice-president for academic affairs, agrees. "The national labs have a lot to offer to university research and education and to technology transfer. With this new jointly administered laboratory, we have found a way to work more efficiently and to get the latest advances in materials out where they do the most good."

Initial projects, which involve the advanced processing of polymer, metal, and ceramic materials, include high-temperature crystal growth of re-

fractory borides, structural analysis of colloids, and aerosol generation of ultrafine-particle ceramics.

The laboratory will be able to accommodate visitors from private companies who want to learn firsthand about the latest developments in advanced materials. It is expected that there will be significant involvement by industry researchers selected for the Department of Energy Industrial Internship Program. This program permits researchers from institutions nationwide to work on projects of mutual interest with their counterparts in the DOE national laboratories.

### Eight Professors Appointed

Also announced were the first eight appointments to the UNM-National Laboratories Professorship Program. The three-year appointments allow Sandia scientists and engineers to teach courses, participate in research projects, and supervise graduate students at UNM. The program is another new collaborative project through which Sandia and UNM share the cost of bringing renowned scientists into the classroom.

The eight Sandia professors are Marshall Berman (6517), Bob Blewer (DMTS, 2132), Jeff Brinker (DMTS, 1846), Olden Burchett (9333), Ralph Dawson (DMTS, 1144), Mike Forrestal (DMTS, 9123), Cliff Mendel (DMTS, 1263), and John Shelnett (6211). ●AEtheridge(3161)



**CELEBRATING QUALITY PROGRESS** — Component Development 2000's Quality Exchange Fiesta offered posters and demonstrations about determining manufacturing capability, project planning and management, establishing specifications, managing change, establishing requirements, reviews, "administrivia," and other quality-related topics. Glen Cheney (VP 2000) says, "Our purpose was to share across the entire organization some of our best work in quality and continuous improvement. Through this sharing process, we hope to stimulate additional insight and further improvement." The fiesta was held last month. A Labs-wide quality fiesta is planned, according to Larry Bertholf (Director of Quality Improvement 7300), but a date has not been set.

## Congratulations

To Jacky and Charles (2858) Yagow, a daughter, Caitlin Marie, June 19.

To Susie and Jaimé (1513) Moya, a daughter, Daniela Christina, June 23.

To Tanya and Greg (9225) Christiansen, a

daughter, Loren Elizabeth, June 24.

To Evelyn and Guy (2851) Northcutt, a son, Charles Corey, June 25.

To Lori Jackson (9110) and David Kozlowski (9132), married in Albuquerque, June 30.

## Earnings Factors April 1990

Savings Plan for Salaried Employees (SPSE)	Earnings Factors
AT&T Shares	.9560
Government Obligations	.9982
Equity Portfolio	.9755
Guaranteed Interest Fund	1.0073
South Africa Restricted Fund	.9747

### Savings and Security Plan — Non-Salaried Employees (SSP)

AT&T Shares	.9543
Guaranteed Interest Fund	1.0072
South Africa Restricted Fund	.9748
Equity Portfolio	.9929

## Welcome

**Albuquerque** — Roberta Borders (21-1), Michele Chavez (21-1), Edward Dibello (3180), Bonnie Livermore (141), Stephen Neff (2543), Dorothy Simpson (22-2), David Szklarz (6231); **Other New Mexico** — Karen Nordquist (122), Orlando Trujillo (7845).

**Elsewhere:** **Alabama** — David Corbett (7851); **Arizona** — Michael Markewicz (2361); **Indiana** — Diane Schafer (6252); **Montana** — Darin Graf (6253); **Michigan** — Patricia Cordeiro (6215); **North Carolina** — Marc Kniskern (1555), Julie Swisshelm (1421); **Ohio** — Dennis Pedrotty (5261); **Texas** — Kevin Abbot (7222), Norma Orand (2625), Walter Witkowski (1523).



# Supervisory Appointments

**MICHAEL EATON** to Manager of Control Systems Dept. 5160.

Mike joined the Labs in June 1964 as a member of the Upper Atmospheric Test Division. His first major assignment in that division was working on ground-system telemetry at Sandia's rocket ranges on Johnston Island and Kauai. He's worked on air delivered seismic and acoustic detectors as part of the Counter Intrusion (COIN) Detection program during the Vietnam War era, and on various security systems for the DoD and DOE.

In October 1975, he was promoted to Supervisor of the Technology Assessment Division in the Nuclear Systems Directorate. He was Supervisor of Command and Control Division II when he was promoted to manager.

Mike has a BS from Montana State University and an MS from UNM, both in electrical engineering.

He enjoys golf, skiing, and boating. Mike and his wife Debbie live in NE Albuquerque. They have two grown children.

\*\*\*

**MARION SCOTT** to Supervisor of Advanced Technology Div. 6258.

Marion joined Sandia in October 1986 and was a member of the Optoelectronic Components



MARION SCOTT

Development Division. He helped develop range-imaging laser radar using gallium arsenide lasers.

He has a BS, MS, and PhD in electrical engineering from Southern Methodist University. Before joining the Labs, he was at

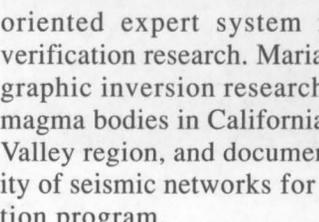
LTV Aerospace and Defense Company, where he worked on CO<sub>2</sub> laser radars, infrared sensors, and optically controlled millimeter wave components. He's a member of IEEE and Sigma Xi.

Marion enjoys coaching his children's soccer and basketball teams and playing softball with the Sandia league. He and his wife Susan have three children and live in the NE Heights.

\*\*\*

**MARIANNE WALCK** to Supervisor of Geophysics Div. 6231.

Marianne joined the Labs in April 1984 as a member of the Geophysics Division, where she has analyzed seismic data for velocity and attenuation structure in the earth. She provided support for the magma energy, in-country seismic verification, and Yucca Mountain projects, and was involved in developing an object-



MARIANNE WALCK

oriented expert system now used in treaty verification research. Marianne performed tomographic inversion research to look for possible magma bodies in California's Coso-Indian Wells Valley region, and documented location capability of seismic networks for the seismic verification program.

She has an AB in geology/physics from Hope

College and an MS and PhD in geophysics from the California Institute of Technology. She's a member of the American Geophysical Union, the Seismological Society of America, and the Association for Women Geoscientists.

Marianne plays violin with the Albuquerque Philharmonic Orchestra and is a member of a string quartet. She enjoys swimming, skiing, hiking, camping, and playing the piano. She and her husband Eric Chael (9241) live in the NE Heights.

\*\*\*

**MICHAEL SJULIN** to Supervisor of Command and Control Div. 5126.

In August 1983, Mike joined Sandia's Systems Test Equipment Design Division, where he designed and developed system test equipment for Pantex. He was project leader for the B61-7 and W88 (Mk5) testers.



MICHAEL SJULIN

He transferred to the Command and Control Division in 1988 and was systems engineer on the Auto-

mated PAL (permissive action link) code-handling system to support various military commands. Later, he was project leader on the coded switch programs and a member of a team working on concepts for the next generation PAL controller for the European theater.

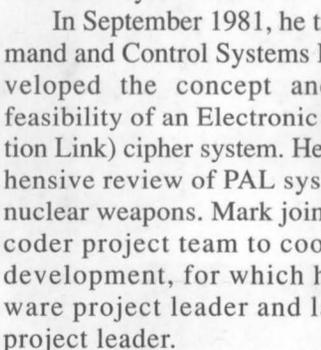
Mike has a BS and an MS in electrical engineering from Oklahoma State University. He is a member of the National Society of Professional Engineers.

He enjoys woodworking, skiing, tennis, golf, racquetball, and gardening. Mike and his wife Janet (7321) live in NE Albuquerque.

\*\*\*

**MARK BLECK** to supervisor of Advanced Command and Control Div. 5128.

Mark joined the Labs in August 1978 as a member of the Advanced Facility Protection Division in the Nuclear Safeguards Directorate. He developed system concepts and prototype hardware to support International Atomic Energy Agency inspections of commercial nuclear fuel cycle facilities.



MARK BLECK

In September 1981, he transferred to the Command and Control Systems Division, where he developed the concept and demonstrated the feasibility of an Electronic PAL (Permissive Action Link) cipher system. He coauthored a comprehensive review of PAL systems for nonstrategic nuclear weapons. Mark joined the T1563 PAL recoder project team to coordinate tech manual development, for which he was systems software project leader and later overall systems project leader.

In September 1986, he was named project leader for the T1582 PAL controller, part of the secure recode system for the Strategic Air Command. He was selected in May 1988 for a temporary assignment as scientific advisor to the US Nuclear Command and Control System Support Staff (NSS) in Washington, D.C.

Mark has a BS in physics from the California Institute of Technology, an MS in mechanical engineering from UNM, and a PhD in nuclear physics from Duke University. He's a member of the American Physical Society. In May, he re-

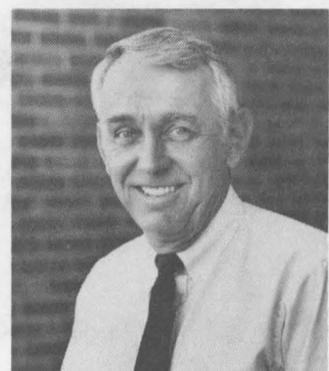
ceived the Secretary of Defense Medal for Outstanding Public Service for his work at the NSS.

He enjoys tennis, radio-controlled airplanes, and coaching his son's soccer team. Mark and his wife Donna have two children and live in the NE Heights.

\*\*\*

**DAVID L. JOHNSON** to Supervisor of Pulsed Power Development Div. 1238.

Dave has been involved in pulsed power research since joining Sandia in 1966 as a member of



DAVID JOHNSON

the Pulsed Power Research Division. He's contributed to the development of several pulsed power accelerators, including Hermes II and III, Proto II, and PBFA I and II.

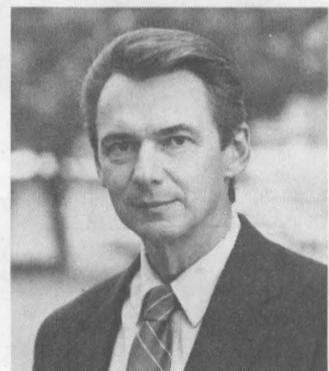
He has a BS in electrical engineering from the University of Minnesota and an MS in the same field from UNM.

Dave enjoys tennis, skiing, and scuba diving. He has two children and lives in the SE Heights.

\*\*\*

**HANK WITEK** to Manager of Security Systems Dept. 5230.

Hank joined Sandia at Livermore in June 1968



HANK WITEK

as a participant in the One-Year-On-Campus program, assigned to the Telemetry Subsystem Design Division. While in that organization, he designed terminal data analyzers for monitoring warheads for Lance and Spartan. He

joined the Special Projects Division in 1974, and has worked on several security and safeguards projects. In October 1978, he was promoted to supervisor of that division.

He next headed the Exploratory Systems Division, where his work included applying asymmetric encryption to command and control hardware. Subsequent assignments included the Strategic and Tactical Phase 1 & 2 Systems Division and the Engineering Projects Division, which was responsible for development-to-production transition of the MX warhead. He transferred to Albuquerque in 1987 and supervised the Electronic Subsystems Division. This division was responsible for the design of B-61-6, 8 and nuclear depth strike bomb programmers; real-time hardware for automatic target recognition; and custom hardware to detect purposeful motion in a video scene.

Hank has a BS in electrical engineering from Illinois Institute of Technology and an MS in the same field from the University of California through Sandia's OYOC program.

He enjoys racquetball, tennis, photography, and travel. Hank and his wife Mary have two children and live in the NE Heights.

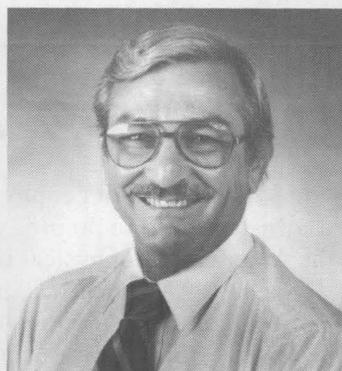
## Fun & Games

*Golf*—The SWGA 18-hole tournament was held June 23 at UNM South Golf Course. Prizes were awarded to: Fay Joy, first low net; Dee Chavez (1000), second low net; and Ruth Wright, low putts. Blind draw winners were Teri Carpenter (3731) for first low net, Janice Montoya (153) for second low net, and Peggy Burrell (6000) for low putts. Ginny Moore (2100) was the tournament director.

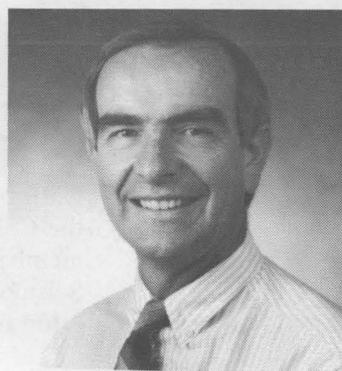
# MILEPOSTS

## LAB NEWS

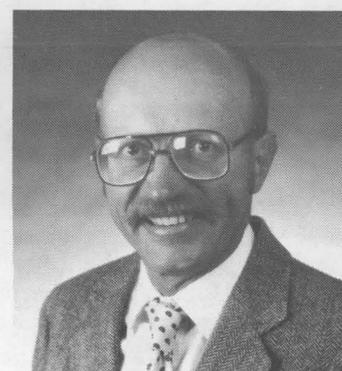
July 1990



Thomas Workman  
(7530) 30



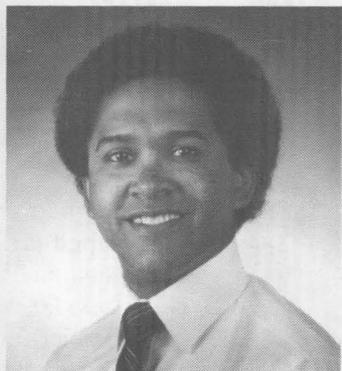
Dick Hay  
(7523) 25



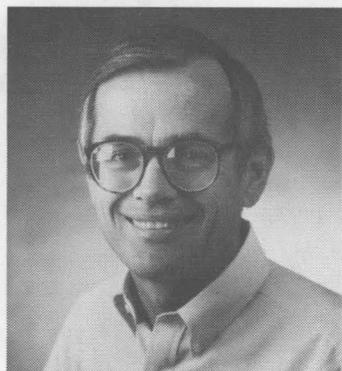
Paul Plomp  
(7483) 25



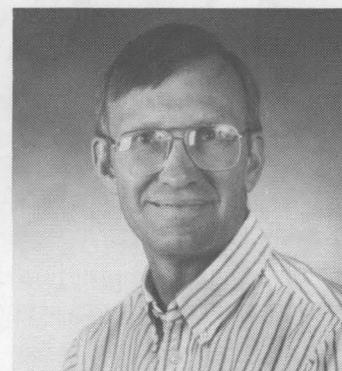
Gene Cnare  
(1221) 35



Mark Schaefer  
(2618) 15



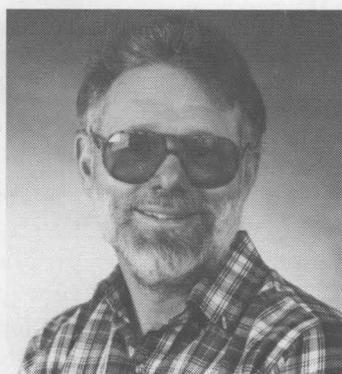
Don Schroeder  
(5145) 25



Al Giddings  
(DMTS, 2345) 30



Jaye Bullington  
(9119) 15



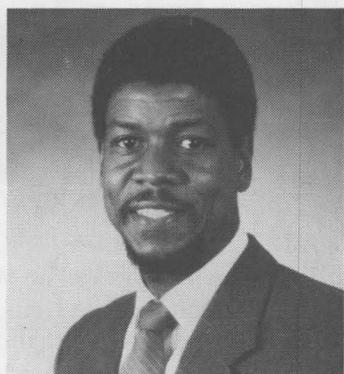
William Shurtleff  
(7552) 25



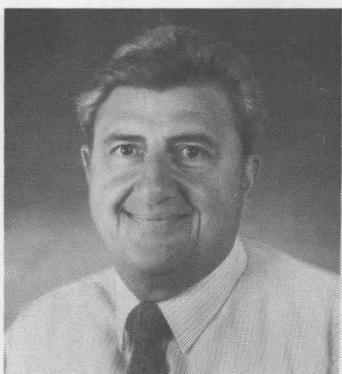
Bill Ulrich  
(5114) 35



Pat Walter  
(7526) 25



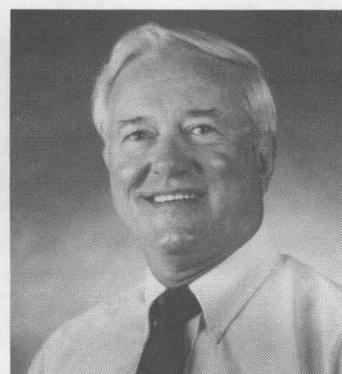
Basil Steele  
(5249) 15



Anthony Russo  
(DMTS, 1511) 30



Michi Wada  
(2113) 15



Leo Klamerus  
(6316) 30



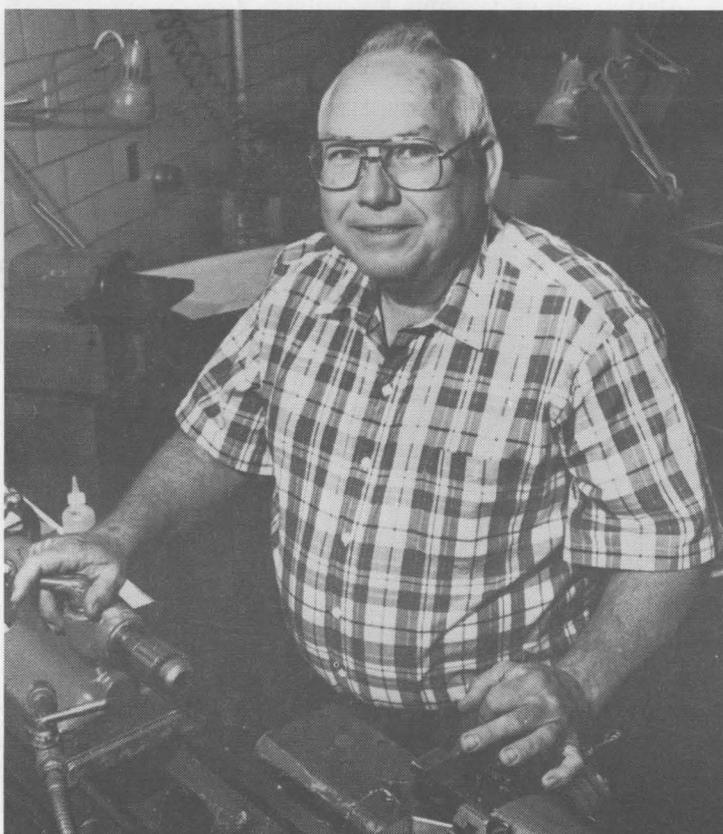
Richard Sons  
(2531) 25



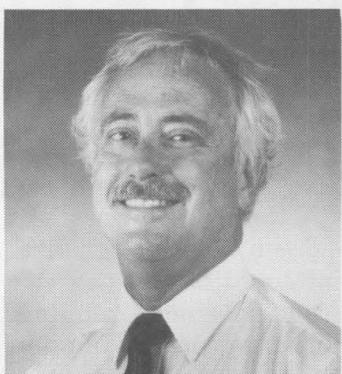
DuWayne Branscombe  
(2114) 30



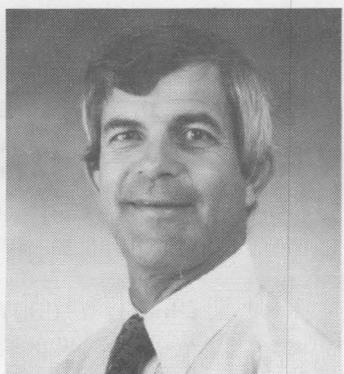
Billie Garcia  
(3741) 15



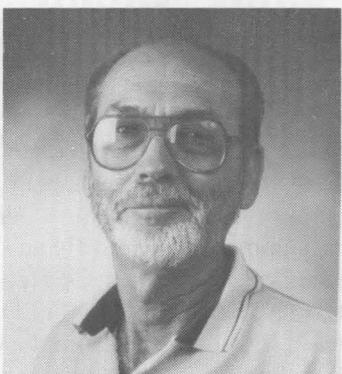
Leroy Gibson  
(7481) 35



David Darsey  
(2618) 25



Paul Beck  
(9216) 25



Kenneth Ream  
(5249) 30



**Favorite Old Photo**

LEROY GIBSON (7481-5) submitted this favorite old photo — several pieced together, actually — from his childhood days in the oil fields 20 miles from Enid, Okla. Taken from atop an oil rig in 1926 (8 years before Leroy was born), it illustrates how much the landscape has changed. Today, the forest of huge oil rigs that once dominated the landscape is gone — in its place is farmland,

caps that cover now-dry wells, and only an occasional small rig that operates independently, without human labor. Leroy's grandfather, father, and six of his uncles worked on the oil rigs, along with the other pumpers, gaugers, and roustabouts when he was a child. Today, many Gibsons are Sandians instead of oil workers — including Leroy's brother, Archie (2631); son, Curtis (7481); and daughter-in-law, Gloria (3142).

**UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS**

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

**Ad Rules**

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

**MISCELLANEOUS**

**KING-SIZE WATER-BED SET:** mirrored dresser, chest, nightstand, \$600; queen-size 4-post water bed, ultra-firm waveless mattress, \$250; Vitamaster exercycle, \$75. Kaiser, 298-1315.

**MICROWAVE OVEN,** \$80; electric built-in oven, \$35; cook top & hood, \$30; glass-door tub enclosure, \$15. Gendreau, 268-3436.

**SEARS CRIB,** dark brown, w/mattress, \$70; Cuisinart food processor, \$50. Keener, 255-8482.

**CEMENT CYLINDERS,** 6" dia., 12" long, 3 for \$1 or all 126 for \$38. Hole, 255-1444.

**CAMPER SHELL** for El Camino, \$175 or trade. Chavez, 242-9074.

**CAMPER SHELL,** accordion-folding, for LWB Chev. or GM pickup, metal frame, back & front windows, \$175. Shunny, 265-1620.

**DINING-ROOM TABLE,** w/4 chairs, 52" round, 2 leaves to seat 6, protective cover, \$275. McCord, 281-2146.

**DINING-ROOM SET:** Victorcraft, dark rattan, glass-top table, 6 chairs w/Haitian white cushions, cost \$2572, sell for \$995. Schkade, 292-5126.

**POOL TABLE,** 3' x 7', \$75; DP rower/exerciser, \$40; Marcy sit-up slant board, \$30. Reber, 298-6053.

**CANON A-1 35mm SLR CAMERA,** 50mm 1.8 lens, case, strap, Canon flash, \$375. Bronkema, 292-6342.

**FREEZER,** Imperial heavy-duty commercial, upright, 18 cu. ft., 8 yrs. old, \$150 OBO. Wilson, 294-2831.

**CAMPER SHELL** for small pickup, \$100 OBO. Hammond, 294-2045.

**SWIMMING-POOL HEATER,** Gemini Raypac, 261,000 Btu, \$50; black polyethylene film, 6-mil., 20' x 23', \$10; 20' x 50', \$20; 10-mil., 20' x 9', \$5; 20' x 13', \$7. Hill, 884-4721.

**LEADING EDGE COMPUTER MONITOR,** monochrome, \$50; 13" Teknika color TV, remote control, \$75. Brandon, 836-5621.

**WHITE-WATER RAFT,** 14', 840 denier, outfitted, \$900 OBO. Harrington, 296-8208.

**RECLINER,** \$75 OBO. Sikora, 891-7862.

**COMPUTER PRINTER,** Citizen 180D, needs print head; 4 ribbons for Citizen 180D or 120D, \$5/ea. Schowers, 822-8494.

**POOL TABLE,** Brunswick Dunham model, slate bed, full ball return, \$500. Posey, 255-6687.

**WATER BED,** king-size frame, \$100 OBO; regular queen-size frame, with or without headboard, \$30 OBO. Mesibov, 292-1249.

**PROGRESSIVE SHOTSHELL RELOADER,** Ponsness Warren, \$300; RCBS brass cartridge reloader, w/3 sets of dies, 30.06, .308, .44-mag. Guthrie, 873-1165.

**GUITAR:** '76 Fender Stratocaster, maple w/white hardware, Bicentennial model, \$425. Lynch, 292-8523.

**DRAPES,** custom-made, gold, 92" long, 101" wide. Sedillo, 255-0669 evenings.

**REFRIGERATOR,** Norge, 22.5 cu. ft., frostless, 3 doors, w/ice maker, tempered-glass adjustable shelves, 7.2-cu.-ft. freezer. Youngman, 255-7382 leave message.

**KITTEN,** 7 wks. old, tiger-striped black & white, female, free. Lee, 836-4353.

**WINDSURFER,** Mistral sail, beginner-intermediate, w/rack, \$200 OBO. Durkee, 255-4211.

**CARDBOARD BOXES** and packing material, free. Hubbard, 281-1779.

**WEBER BARBECUE GRILL,** 22", \$20; redwood picnic table & 4 benches, \$10. Kepler, 296-0402.

**FIREPLACE,** Majestic, zero clearance, all metal, 3-layered firebox, complete w/chimney, \$100 OBO. Caldwell, 821-7686.

**MAPLE DINETTE,** 5-piece, 36" x 48" table, \$125; coffee table, 48" x 18", \$25; cooler ceiling vent, \$15; 12" wind-turbine base, \$10. Erni, 294-5667.

**TWO SOFA SLEEPERS,** double-size, 1 gray print, 1 floral print, \$50. Ortega, 294-8169 after 5.

**RALPH LAUREN "CHAPS" WOOL SUIT,** 32W, jacket 39, \$200 OBO; man's '88 San Marcos racing ski boots, 10-1/2, \$175. Lobitz, 281-1514.

**DINING TABLE,** pecan wood, 4 chairs, extra leaf, \$125. Stephenson, 296-9330.

**CHAIN SAW,** McCulloch, 14", used once, \$75; twin brass headboard, \$45; beveled mirror, 2-1/2' x 4', \$35; power mower, \$35. Haushalter, 821-4138.

**TWO TRAILER TOWING MIRRORS,** fit all cars and trucks, \$15. Pfeiffer, 299-3951.

**STUDENT VIOLIN,** Scherl & Roth, w/case, \$225; Bell & Howell "cube" slide projector, remote control, \$50. Magnuson, 268-5955.

**SIDE-BY-SIDE CRYPTS,** pair, original indoor crypts adjacent to chapel in Sunset Mausoleum. Schneider, 299-6243.

**AMISH QUILTS,** new, handmade in Pennsylvania, different sizes available. Kraynik, 294-1043.

**MCS 5000 SERIES STEREO SYSTEM,** w/cabinet & speakers, \$595; 10' cab-over camper, heater, gas refrigerator, \$595. Davis, 881-7068.

**'71 CAMPER TRAILER,** 17', flush potty, 10-gal. water tank, stove, oven, refrigerator, 4000-watt generator, \$1200 OBO. Phelps, 828-2163.

**YOUTH SADDLE,** \$75; exercise bike, \$35; Burris range finder, 3x9 scope, \$125; upright piano, \$325; video game, \$75. Dean, 299-3281.

**SWING SET,** \$30; child's sink, \$5; bicycle training wheels, \$2; child's booster car seat, \$10; small freezer, \$25. Follstaedt, 299-5941.

**TRAVEL TRAILER,** 8' x 40", w/2 tip-outs, \$5000 OBO. Ramos, 262-0003.

**BROTHER KNITTING MACHINE,** KH820, make offer. Stixrud, 298-0478.

**REALISTIC 200-CHANNEL SCANNER,** \$125; TRS80 Model 4D computer, w/TRSDOS, CP/M, Turbo Pascal, \$500; engine analyzer, \$30 OBO. Hawthorne, 1-471-0448.

**ELECTROPHONIC AM/FM EIGHT-TRACK,** w/record player, in cabinet, \$60. Boston, 298-9727 or 291-8810.

**TREADMILL,** Ajay VS 1000, 51 miles, cost \$400, sell for \$150. Olbin, 275-2681.

**TRUCK TOOLBOX,** metal, 16" x 16" x 45", \$125 OBO. Schaub, 865-9581.

**GE 19" COLOR TV,** VCR. Coulter, 255-6436.

**GARAGE SALE:** disc slide projector, desk, sleeper sofas, picture frames, sports equipment, July 21, 9 a.m.-2 p.m., 7005 Vista del Arroyo NE. Muir, 883-7933.

**DINING SET,** solid oak, square table, 4 chairs, \$175. Powell, 265-2832.

**ORIGINAL '77 R.C. GORMAN PAINTING,** 48" x 30"; 2 Manuel Cia originals, 24" x 18", 20" x 12". Baca, 265-2881.

**TANDY 1400LT LAPTOP COMPUTER,** 3-1/2" drives, backlit screen, power supply, extra battery, manuals, MS-DOS 3.2, GW-BASIC, other software, \$750. Nunez, 884-3623.

**MAPLE DINING TABLE/CHAIRS,** \$490; china cabinet, \$350; occasional tables; metal clothes closet, stereo record player, \$75. Joseph, 299-6989.

**METRANOME,** electric, volume control, light indicator, \$25. Moss, 298-2643.

**DOUBLE BED,** dresser, chest, blond oak; 4 dining-room chairs; 3 sewing machines; best offer. Carter, 845-9207.

**STUDENT DESK,** natural color, \$75. Preston, 821-8028.

**TWO CAMPERS,** w/stove, refrigerator, sink, sleep 6; shell; Chinese sharpei. Sanchez, 873-4281.

**EXERCISE BICYCLE,** 38-lb. weighted wheel w/ergometric measure, caliper resistance brakes, electronic console, \$75. McIntosh, 294-5351.

**TRANSPORTATION**

**'85 CORVETTE,** AT, glass top, car phone, Delco-Bose stereo, Michelin tires, two-tone blue, \$15,500. Kaiser, 298-1315.

**PANASONIC 12-SPD. BICYCLE,** 25" frame, w/front and rear bags, \$75. DeReu, 275-2336.

**'80 BUICK REGAL,** AT, PC, PS, PB, 112K miles, \$1500; '86 Ford Ranger, LB, 5-spd., AC, PS, PB, \$5800. Tennyson, 292-5844.

**'84 SAAB 900,** white, AC, PS, FWD, 30 mpg, Blaupunkt AM/FM cassette radio w/4 speakers, 55K miles, \$5700. Lane, 299-7925.

**'82 FORD ESCORT SW,** 52K miles, AC, AM/FM cassette, new Michelins, \$2000 cash. Adelmann, 898-0335.

**'86 MUSTANG GLX,** wood grain, leather, AC, AM/FM cassette, PB, PS, PW, \$4000. Dubois, 869-2200 leave message.

**'84 FORD RANGER XLT,** w/Admiral over-cab camper. Babcock, 881-3563.

**'81 VW VANAGON GL,** rebuilt engine, 18K miles, \$2700. Jones, 299-4776.

**'81 TOYOTA CELICA GT,** liftback, 5-spd., AC, AM/FM cassette, copper brown, \$2400 OBO. Hanson, 883-0623.

**'81 FORD GRANADA,** 4-dr., AC, AT, PS, \$1400. Martinez, 298-7382.

**'81 YAMAHA 570 SECA MOTORCYCLE,** fairing, rack, engine guards, accessories, 26K miles, \$1195 OBO. Youngman, 255-7382 leave message.

**'84 TOYOTA TERCEL WAGON,** 4-WD, 59K miles, AC, 5-spd., new tires & battery, one owner, \$4995 OBO. Garcia, 823-6630 leave message.

**'82 YAMAHA MOTORCYCLE,** YJ650 XE turbo, loaded, \$1500 OBO. Smith, 275-8185 after 5.

**'79 YAMAHA IT175 DIRT BIKE,** extra parts, manual, \$175 firm. Hubbard, 281-1779.

**'73 CADILLAC ELDORADO CONVERTIBLE,** 501 cu. in. V-8, AM/FM cassette, leather seats, FWD, \$3900 OBO. Burnett, 298-1078.

**'81 GMC SIERRA PICKUP,** new custom top, 350 V-8. Vazquez, 298-2510.

**CHILD'S BICYCLE,** 16" Schwinn, chrome frame, \$60; training wheels extra. Hartwig, 298-5048.

**'85 HONDA PRELUDE 2.0 SI,** 5-spd., all amenities, original owner, 39K miles. Clevenger, 821-0046.

**BICYCLE,** MASI Nuvo Strada, 56cm, Columbus SLX/SPX, Campagnolo Chorus Gruppo, avocet 30 computer, sew-ups, extras, \$1300. Gonzales, 296-4704.

**'81 PLYMOUTH HORIZON,** 47K miles, one owner, 4-dr., 4-cyl., AT, passed recent emissions test, \$1400. Maloney, 828-9610.

**'50 CHEV. TRUCK,** 3100 Series, 6-cyl., 4-spd., runs but needs works, \$500 OBO. Phelps, 828-2163.

**'86 PLYMOUTH TURISMO,** 2.2, white w/red interior, 5-spd., AC, AM/FM tape, \$4000. Gauerke, 892-6406.

**BICYCLE,** Raleigh Super Grand Prix, 22-1/2" frame, 12-spd., gel saddle, Borend shifters, rear rack, \$95. Smith, 243-0714.

**'77 CHEV. PICKUP,** 4-spd., shell, new tires, PS, PB. Shead, 294-9698.

**'73 JEEP PICKUP,** 4x4; '77 Jeep Cherokee parts. Morrow, 281-9607.

**REAL ESTATE**

3 HOUSES, 3 duplexes, 1 apt. on 3

lots near UNM/TVI, \$312,000, \$74,000 equity, can sell separately. Finnegan, 294-0684.

**4-BDR. HOME,** 1-3/4 baths, detached double garage, 1700 sq. ft., solar panels, fruit trees, corner lot. Posey, 255-6687.

**2-BDR. MOBILE HOME,** 14' x 56', 1 bath, insulated skirting, 8' x 10' shed, 5' x 16' covered porch, take over \$203.16/mo. payments. Guthrie, 873-1165.

**4-BDR. FOUR HILLS HOME,** 2700 sq. ft., new kitchen, atrium, hardwood floors, hot tub, \$129,900, make offer. Blaich, 294-6662.

**2-BDR. HOME,** 1-3/4 baths, 1345 sq. ft., swimming pool, fruit trees, other amenities, \$64,500. Arris, 266-3414.

**1-1/4 ACRES,** at Thompson Ridge in Jemez Mts., wooded, electricity and water available, \$15,900. Davis, 881-7068.

**3-BDR. BRICK HOME,** 1-3/4 baths, 2000 sq. ft., Sandia HS area, solar water, mature landscaping, FP, den, \$119,000. Sundberg, 299-2134.

**1+ ACRE,** wooded, Pecos Canyon, river across the road, 12' x 65' mobile home, all utilities, year-round access, covenants, \$50,000. Sullivan, 892-3167.

**1/2-ACRE,** 3-rm. house, Mora, NM, shade, fishing, \$10,000. Lovato, 255-6634 after 5.

**WANTED**

**IBM OR IBM-COMPATIBLE PC,** for church use, donate or cheap. Smith, 299-1959.

**SHOP MANUAL** for '73 GMC pickup. Jacobs, 281-9483.

**BACK ISSUES** of *Sports Illustrated* and *The New Yorker* magazines from 1955 to 1972. Cline, 298-5492.

**HOME** for large, lovable springer spaniel, has papers, needs space, liver & white male. Schowers, 822-8494.

**BOOKS:** *Psychiatric Experiences of the Eight AAF 1943-44* by Hastings Wright Glueck; *Roswell Incident*, Charles Berlitz; *Roswell AAF 1947 Yearbook*. Harris, 255-6577.

**GOOD HOME** for German Shepherd-mix puppie, female, 6 mos. old, gentle. Martinez, 298-7382.

**TRANSPORTATION** for 6- & 9-yr.-olds to after-school activities; child care in our home downtown, Mon.-Fri., 3-6:30 p.m. Sweeney, 247-4866.

**RECEIVER HITCH** for full-size Bronco. Cotter, 897-1470.

**LOST AND FOUND**

**FOUND:** green spiral notebook, "Alan's Journal," at Van Buren Middle School soccer field. Dukart, 296-0155.

**SHARE-A-RIDE**

**VANPOOL RIDERS NEEDED:** full & part-time seats immediately available from Santa Fe to KAFB and Sandia Labs. Hawthorne, 1-471-0448.

**Coronado Club Activities**

# Hop Aboard the Chattanooga Choo-Choo For a Mellow-Music Trip Down Memory Lane

DON'T SIT UNDER THE APPLE TREE — Instead, grab that String of Pearls, hum a bit of Elmer's Tune, and listen to a Serenade in Blue from 8 to 11 p.m. tonight, July 13, courtesy of the Roland De Rose Orchestra. This group plays Big-Band songs from the '40s, and you can even understand the words! Beforehand, some pretty elegant dinner entrees include prime rib (\$7.95), lobster tail (\$13.95), filet mignon (\$8.95), or poached salmon (\$6.95). There's a free half liter of house wine — Moonlight Cocktail? — for each couple having dinner. (Who said Friday the 13th is unlucky?) Reservations *definitely* recommended (265-6791).

CALLING ALL FLEAS, or at least bona fide sellers and buyers of fleas. The C-Club's first-ever

flea market — a purchaser's paradise if there ever was one — is this Sunday, July 15, from 9 a.m. to 2 p.m. in the front parking lot. You may still be able to rent a space from which to sell all those treasures (\$4); give the office a call to find out. Plenty of reasonably priced food is available in the BBQ food line, so plan to make a day of it.

THE JOINT'S JUMPIN' IN JULY, especially if you go for bingo in a big way. Budget bingo's always on Tuesday, while the regular games are every Thursday. Card sales for both start at 5:30 p.m.

SPEAKING OF JUMPING JOINTS, your leg joints will be doing just that as you stomp around next Friday night, July 20. The Isleta Poor Boys make a return visit that evening to belt out their

good ole c/w music from 8 p.m. to midnight. Before the shuffling starts, chow down on either prime rib or albacore tuna (both \$7.95).

A BRUNCH OF FUN is in store Sunday, July 22, from 10 a.m. to 2 p.m. Once again, the marvelous menu is available for \$5.95/adults and \$2.50/children under 12.

THUNDERBIRD RETIREES are currently studying the revocable living trust (RLT) as a way of organizing estates and personal affairs, and they like what they see. In fact, the T-Birds are forming a group to negotiate for legal services on RLTs, which should mean substantial savings. Retired or not, you're welcome to join the group. Call Barney Barnett on 293-8040 for more information.

## Fun & Games

**Bowling** — SANDOE Bowling Association Bowlers-of-the-Month for April/May are: Scratch — Thomas Archuleta (7485), 656; and Trinie Chavez, 552; Handicap — David Norwood (7411), 641, 689; and Millie VanTheemsche, 503, 644.

\*\*\*

**Golf** — On May 5, the Sandia Golf Association sponsored the Rail Classic at the Tierra Del Sol Country Club in Belen. Tournament format was two-man, one best ball, full handicap. Gift certificates were awarded to first, second, and third place finishers in two flights. A Flight winners were John Garcia (6423) and Joe Torres (1273); B Flight — Paul Seward (9334) and Robert Statler (7519). Prizes were also awarded for long drives and closest to the pin on all par-3 holes. Eli Perea (2543) and Evans Craig were tournament co-chairman.

A two-day SGA Open was held June 9-10 at the Ladera and Arroyo Del Oso golf courses. In each of the three flights, six low net and two low gross prizes were given, plus prizes for closest to the pin for each of the par-3s each day and for long drive by flight each day. A special prize was given for the winner of a bankers' handicap (blind draw of six holes to determine handicap) the second day. Winners were: A Flight — Richard Adams (1275), low net; Lloyd Chapman (ret.), low gross; B Flight — Bob Paulsen (9011), low net; Roy Tucker, low gross; C Flight — Tommy Barreras (2852), low net; Larry Hostetler (9133), low gross. Bob Paulsen and Phil Fagan were tournament co-chairmen.

\*\*\*

**More Golf** — Sandia Women's Golf Association (SWGA) held a 9-hole tournament June 30 at the Arroyo Del Oso Golf Course. Awards were presented to the following winners: Flight A — Sandy Monroe (1845), first low net; Delores Worley, second low net and longest drive; Minnie Shurick, third low net; Flight B — Marlene Shields (7542), first low net; Dave Goodnow (1842), second low net and longest drive; Betty Turk (4000), third low net; Flight C — Suzette Beck (4021), first low net and longest drive; Shirley Lopez (3745), second low net; and Janice Montoya (153), third low net. The low-putts award was presented to Mike Fitzpatrick and the participation drawing was won by Georgianne Huff (7842). Karen Varga was the tournament director.

July tournaments include UNM North on July 14 (9-hole), Angel Fire on July 21-22 (18-hole), and Ladera on July 28 (executive 3-par). For information about the tournament schedule and SWGA participation, contact Teri Carpenter on 256-0614.

## Events Calendar

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

July 13-Aug. 5 — Exhibit: "From the Land of Dragons," collection of rare fossils, mostly from China; 9 a.m.-6 p.m. daily; New Mexico Museum of Natural History, 841-8837.

July 13-Sept. 14 — Exhibit: "Raymond Jonson: Geometric Form in the Pursuit of a Unifying Principle"; 9 a.m.-4 p.m. Tues.-Fri., 5-9 p.m. Tues. evening; UNM's Jonson Gallery, 277-4967.

July 14 — Nob Hill Charity Auction & Street Fair, benefit for Bright Horizons center for abused children; auction is at 3600 Central NE, street fair is district-wide; 1-4 p.m., 262-1682.

July 14 — Summerfest '90: Irish Night, ethnic food, arts & crafts, dances; 5-10 p.m., free, Civic Plaza, 768-3490.

July 14 — New Mexico Iris Society Iris Sale; 9 a.m.-1 p.m., Albuquerque Garden Center (10120 Lomas NE), 294-4955.

July 14 — Exhibit opening: "Birds/Portraits," 40 oil portraits of birds seen in the Southwest by Austin, Tex., artist Benita Giller; 9 a.m.-5 p.m. daily, East Gallery, New Mexico Museum of Natural History, 841-8837.

July 15 — Sunday Jazz at the Rio Grande Zoo, an afternoon of music under the cottonwoods, featuring New Mexico jazz artists, presented by the New Mexico Jazz Workshop; 1:30-5 p.m., Rio Grande Zoo, 255-9798 or 843-7413.

July 20 — "Music of the Americas — 1990," featuring Yomo Toro, traditional Puerto Rico jibaro music, annual family musical event presented by Friends of the

South Broadway Cultural Center and the City of Albuquerque, a program of the Santa Fe Music Festival; gates open 6 p.m., performance 7:30 p.m.; Rio Grande Zoo, 848-1320.

July 20-22, 27-29 — "Something's Afoot," by James McDonald, satirical poke at Agatha Christie murder mysteries and musical styles of the past, presented by the Albuquerque Civic Light Opera; 8:15 p.m., 2:15 p.m. Sun.; Popejoy Hall, 345-6577.

July 21 — Summerfest '90: Greek Night, ethnic food, arts & crafts, dances; 5-10 p.m., free, Civic Plaza, 768-3490.

July 21-22 — Arts & Crafts Fair and Attic Sale, sponsored by the Council of Albuquerque Garden Clubs, 40 artists and craftspeople; 10 a.m.-6 p.m. Sat., 10 a.m.-4 p.m. Sun.; Albuquerque Garden Center (10120 Lomas NE), 296-6020.

July 22 — Arts in the Parks: Renaissance Fair, featuring Society for Creative Anachronism and the Santa Fe Early Music Ensemble, sponsored by Albuquerque Parks & Recreation Dept.; 1-5 p.m., Bataan Park, free, 764-3490.

July 26-28 — "The Traveling Bandit Show," Albuquerque Children's Theatre presentation, wild-west comedy for children written by ACT director Sue Ann Gunn; 1:30 & 3:30 p.m., Rodey Theatre, 277-3121.

July 27 — Crownpoint rug auction; 3 p.m. rug viewing, 7 p.m. auction; Crownpoint Elementary School (Crownpoint, NM), 786-5302.

July 28 — "Salsa Picoso," dance to music performed by 13-musician salsa band directed by Hector Garcia; 8:30 p.m.-midnight, UNM Continuing Education Bldg. (1634 University NE), 277-6945.



THANKS FOR A GOOD IDEA — Jennie Negin, Manager of Technical Library Dept. 3140, recently received President Al Narath's thanks for coming up with a graphic that depicts — in an understandable way — how the main initiatives in Sandia's Strategic Plan support the Labs' mission. The design was used on cards handed out to employees at Vision Day in April. The framed memento Al presented to Jennie includes her original note to him describing the concept, along with an interim and final version of the Vision Day card — and, of course, a personal note of thanks.