

CONCEPTUAL DESIGN of the new VLSI facility for the 2100 organization is part of the package of design specifications prepared by Mike DeWitte's Buildings and Facilities Design Division III 3643. The two-story building will have two separate but related sections — an office and light laboratory area and a 13,000-square-foot "super" clean room (Class 1-10 clean room — less than one micro-

meter particle per cubic foot of air). The 2100 group will "aggressively" pursue research and development of a new generation of VLSI (Very Large Scale Integration) devices — a goal is to build a computer in one cubic inch with computing power equivalent to a VAX. The facility, to be built east of Bldg. 870, needs Congressional action for its estimated \$25 million funding.

### **Sandia Moving 'Aggressively' Into VLSI Development**

## **Bendix Assuming IC Production Work**

During the next three years, Bendix-Kansas City will take over production responsibilities for radiation-hardened integrated circuits (ICs) currently manufactured in Sandia's Center for Radiation-Hardened Microelectronics in Bldg. 870. Last year, Sandia delivered 100,000 of the tiny (about one-quarter-inch square) microprocessors, memories, and custom ICs to various DOE, DoD, and NASA agencies for use in weapons and satellites. Compared with those available commercially, the Sandia ICs are unique in that they function in intense radiation environments such as those found in outer space or produced by nuclear detonations.

"We anticipate no effect on Sandia employment and a smooth transition from Sandia to Bendix," says Bob Gregory, Director of Microelectronics 2100. In the past decade we have established a very good re-

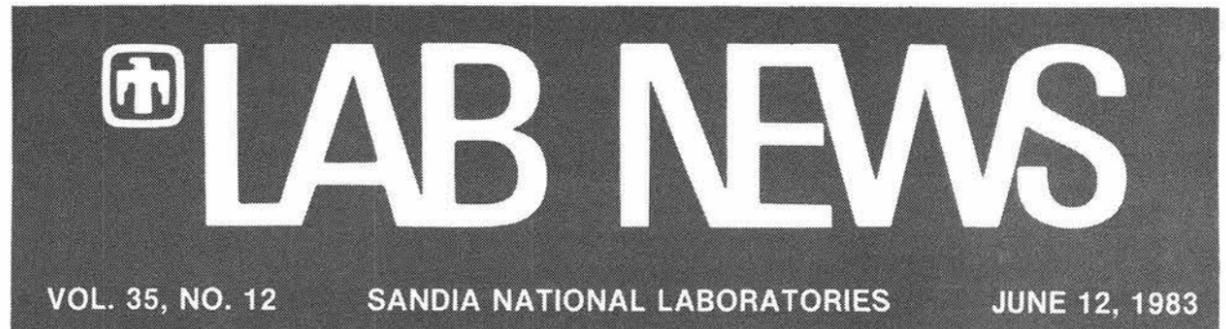
lationship with Bendix — they have excellent experience and skill in assembling semiconductor devices and in fabricating hybrid microelectronics for weapon assemblies."

Gene Alley is the new Bendix Albuquerque Operations Manager heading the IC production in Bldg. 870. He is here now, along with eight other Bendix management people. He expects the Bendix staff to number about 38 by the end of the three-year

transition period. One-third to one-half of these people will transfer from Kansas City; the remainder will be hired locally.

Currently, 65 contract workers from Kirk Mayer, Los Angeles, are operating two 10-hour shifts Mondays through Fridays at the Bldg. 870 facility. Alley anticipates that this arrangement will continue and that Bendix will assume responsibility for con-

*(Continued on Page Two)*



### **Strained-Layer Superlattices**

## **A Promising New Class of Materials**

A highly versatile and significant class of materials is being developed by members of a research team in Solid State Sciences Directorate 1100. Their work is based on advanced solid state theory combined with state-of-the-art crystal growing techniques.

The development, called strained-layer superlattices (SLS), has been announced to the scientific press, and several national publications in the technical field are expected to carry the SLS story soon.

SLSs can be tailored precisely to the task to be performed, so they will almost certainly be valuable in semiconductor device technology and may well be applicable in several other fields as well. They are composed of many alternating layers of different types of carefully grown, ultrathin (<300Å) crystals. The flexibility of design arises because the layers can be chosen independently of the fact that they are mismatched — the distance between the atoms of the material used for a given layer can be different from the corresponding

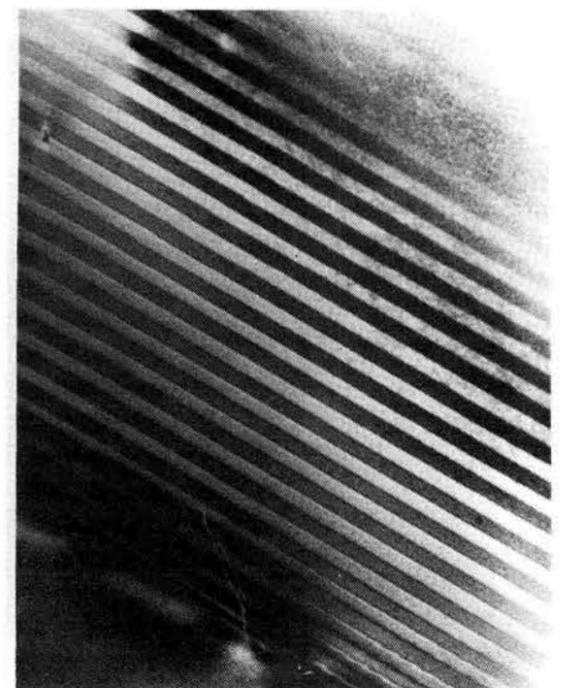
"atomic spacing" of the material used for the next layer.

The layers in SLS materials are so thin — it would take 5000 layers to equal the thickness of a sheet of writing paper — that their atoms align easily by elastic strain during growth, without any of the imperfections between adjacent layers that would otherwise degrade device performance.

The imperfections, which plague similar structures with thicker layers, have prevented full use of many semiconductor compounds that have properties superior to compounds currently in use — for instance, faster switching speeds, more efficient production of light, and adaptability to a wide range of operating conditions. Such properties would permit the development of new or improved devices including some that cannot now be produced with currently available materials such as silicon and gallium arsenide.

The new semiconductor compounds come from elements in Groups III and V of

*(Continued on Page Eight)*



COMPUTER-ENHANCED detail of transmission electron micrograph showing individual layers of strained-layer superlattice (SLS) structure. Shades of gray along length of layers have been averaged out by electronic processing.

# Antojitos

The Fowler Legacy--Despite my failure to use this space to effect minor changes in Sandia managerial philosophy (witness the fact that Organization Change Notices, memos, much of the phone book, etc., still use initials rather than names), I'm now suggesting another change, one inspired by retiring VP Glenn Fowler, about whom more elsewhere.

That change is to increase the number of times & ways in which we Tell the Troops, just as Glenn has done through the years. Tell the troops how whatever they're working on fits into the overall (Sandia and national) scheme of things. Tell them how current projects/programs interrelate with those of other Sandia organizations. Tell them what the goals are. Tell them the successes thus far. And, yes, tell them the failures--and why they happened and what can be learned from them.

That's the what. The how is face-to-face communication--not a memo, not videotape, not even the LAB NEWS. There's simply no effective substitute for a vice-president--live--sharing his (perhaps her) views with the entire staff, answering questions, getting suggestions. And, while the ability to delegate responsibility is a hallmark of the effective manager, delegating communications is not. The message travels to directors who repeat it to department managers who tell it to division supervisors who spew it out to the working staff--that's simply too many filters in the system. Even if what gets said could be controlled, how it gets said can't.

Yes, logistics are a problem. But Glenn has found the time and energy to address 2000 employees--200 at a time--in Bldg. 815. And once we have the new Technology Transfer Center, logistics will be simpler.

The who is easy: everyone in the vice-presidency.

The when is even easier: at least once a year.

The why is the hardest, especially at a place like Sandia. For Sandia deals in classified work that has to follow a need-to-know regulation. Too often, however, that regulation becomes a tradition that extends even to non-classified programs.

So much for why we don't. How about why we should? One reason is that people like to know how their tasks mesh with other tasks and contribute, finally, to Labs' programs. People like to feel that they're trusted by management. And their morale is improved.

More important, perhaps, to management is that people need to know. Knowing how what you're doing fits in and what the priorities are and where you're going is necessary to make the everyday decisions that, in the long run, affect productivity--progress toward successful completion of the various Sandia missions.

Absent such awareness, we're much like the apocryphal galley slaves: "We don't know what war we're fighting. We don't even know which ocean we're in. All we know is that we have to row faster."

Glenn's galley was always one of the best ones to row in. If I can help him to bequeath successfully the traditions of his captaincy, I'm proud. ●BH

Continued from Page One

## Bendix Assuming IC Production

tract management by the last year of the transition.

"In the meantime," Bob says, "Sandia will move aggressively into VLSI research and development. VLSI (Very Large Scale Integration) will take microelectronics into a new era -- semiconductor components with more than a million transistors on each chip. We are talking about using this technology to build a computer that fits in one cubic inch with the computing power equivalent to a VAX 11-750. The metal lines on an individual transistor will be about half the width of a bacterium.

"During the transition period," Bob continues, "we will be working side-by-side with the Bendix people in Bldg. 870, but developing VLSI technology will require new facilities. We'll need a new clean room, an ultra-clean room if you will, and better control of the production environment -- temperature, humidity, and vibration."

Plant Engineering is working on the design of the new building now. Funding for the facility has been requested as part of the FY85 budget submission to DOE.

Meanwhile, transfer of the radiation hardened IC technology to industry continues. Organization 2100 is working with several companies interested in producing and marketing the Sandia-developed designs.

## Sympathy

To Madelyn Sorrell (7483) on the death of her mother in Topeka, Kans., May 26.

To Walt Troy (3436) on the death of his mother in Albuquerque, May 22.

To Sam Thompson (9444) on the death of his daughter in Albuquerque, May 29.



Sixteen years ago, it was pointed out that a milliskirt ends three inches above the knee, and microskirt six inches above, a nanoskirt nine inches above, and a picoskirt one foot above. It is now essential to hold in mind that a femtoskirt ends fifteen inches above, and an attoskirt eighteen inches above the knees. Unfortunately, gigaskirts, teraskirts, petaskirts and exaskirts are at present more fashionable than attoskirts.

— Letter to *New Scientist*

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FOCUSING automatically on their new duties as officers of Industrial Photographers of the Southwest are (l to r) Don Papineau, Russ Smith, and Odessa West (all 3155). Don is a new member of the board of directors and Odessa was re-elected; Russ was elected first vice-president and designated as chairman for the 1984 convention, which will also be the organization's 25th anniversary.

## Plasma Behavior Confirms Math Model

A unique experiment that studies plasma material interactions (PMI) in magnetic confinement fusion devices has been designed by Ron Kerst of Physical Research Division 8347. The experimental results have confirmed Mike Baskes' (8332) calculations of the rate of plasma-driven permeation through the walls of stainless steel vessels.

"Plasma in tokamak or mirror reactors moves along the magnetic field lines that confine the plasma," Ron explains. "Some of the plasma ions move across the magnetic field lines and eventually hit the chamber wall, although many strike internal structures, such as limiters." (These structures are made of refractory material that withstands heat; the chamber wall cannot.)

"When a tritium ion comes in contact with the wall, it picks up an electron from the metal and becomes an atom in solution," says Ron. "Then it starts wandering through the metal lattice. There's a possibility that a given tritium atom will make its way to the outside surface. One tritium atom cannot pop out of the surface — but two can meet, become a molecule, and be released as tritium gas. This process is called molecular recombination. If there's a water coolant on the outside, other surface reactions may come into the picture. Although hydrogen and deuterium can do the same thing, tritium is the main concern, because it's radioactive. Consequently, reactor designers need to know how much tritium permeates through the wall over a period of time."

The permeation rate is a key factor in fusion reactor design and operation. The higher the permeation rate, the more tritium in wall coolant and the greater the cost of removing it.

"The rates for tritium diffusion through many materials are well known," says Ron. "The weak link in our knowledge is the effect of a plasma on the molecular recombination rate at surfaces — its value for stainless steel varies by four orders of magnitude, depending on surface conditions."

The tritium plasma experiment, or TPX, located in Sandia's Tritium Research Laboratory, is the only experiment in the world that operates tritium discharges to observe their effect on material surfaces. In the chamber, ion fluxes and energies matching the range of those in the edge plasma of a magnetic fusion reactor are created. This is the cooler, outer region as opposed to the hotter core plasma. Although the TPX isn't a reactor, it can simulate this edge plasma, as well as the permeation process that Ron measures to determine how tritium makes its way to the outside surface of a fusion reactor wall.

"I've discovered that at an energy level of less than 20 electron volts," says Ron, "as many as two percent of all incident ions permeate through a 0.25 millimeter-thick sample of stainless steel, while at 300 electron volts the permeation rate is much lower — by a factor of more than 100."

Ron explains that there are two energy regimes — one high and the other low. The transition point from the low to the high-



AT THE Tritium Research Laboratory, Ron Kerst (right) discusses the latest experiment with Wayne Chrisman (both 8347). The Tritium Research Lab is the only one in the world that duplicates tritium discharges for the purpose of observing their effect on material surfaces.



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energy regime is 40 eV, which is surprisingly low; above this energy level, the permeation rate is much smaller.

Mike Baskes wrote DIFFUSE, the computer code that models all three permeation phenomena and makes it possible to understand the experimental results. Mike notes that "the high energy ions are able to modify the stainless steel surface, increasing the recombination rate at the inside wall and thereby reducing the permeation. Low energy ions apparently don't modify the surface."

"An important goal now," Ron says, "is to explain why the particle energy has this effect on permeation rates. Other goals are to measure this process for other metals such as ferritic steel, copper, and materials coated with titanium carbide and beryllium." Wayne Chrisman (8347) "runs the laboratory and designs and maintains the equipment," says Ron. "Without Wayne, the lab couldn't operate."

### Congratulations

Merle Snyder (8412) and Marlyn Steele, married in Reno, Nevada, on May 10.

Chris Blocker and Herb Woelffer, both Wells Fargo guards at Sandia, married in Livermore, May 8.

Brian Chamberlain (8214) and Cynthia Renee Spangler, married in Livermore, May 21.



BERT BARKER (8331), an instructor for the Amador Adult Education program in motorcycle riding safety, recently taught another Sandian, Terry Schoeppe (8512), in one of the courses. The courses, under the auspices of the Motorcycle Safety Foundation, include one in the fundamentals of motorcycle handling and a second class for those more experienced in biking. The basic course runs 20 hours over three weeks and involves eight hours of classroom time and 12 hours of riding cycles provided by the course. It's held at Amador High School on Saturdays. Anyone interested can contact Bert or the Amador Adult Education office.

# An Illustrious Career Ending

Glenn Fowler (9000) is retiring. He's been associated with the mission of the Labs since before the Labs, as such, was even founded, so it's a good time for some retrospection. Reviewing his professional accomplishments and personal philosophies is a good way to remind both old-timers and short-timers of Sandia's history from the perspective of one who lived it.

## Radar Development

The story begins well before Sandia was ever thought of. In 1941, within a few weeks of leaving UC Berkeley (with a degree in electrical engineering) and signing on with the Radiation Laboratory at MIT, Glenn was the hands-on developer of one of the first working models of a short wavelength radar. That device was built around a British invention, the magnetron tube, that has been called "World War II's most famous example of reverse lend-lease." The British were using long wavelength radar to provide warning of Luftwaffe air strikes and thus avoid having to have the Royal Air Force in the air around the clock. But they didn't have time or people to develop a radar that would be useful for finer resolution, like that needed by fighter plane pilots and anti-aircraft gunners. That's when MIT got involved.

"It was strictly a lash-up device," Glenn recalls, "but I got my first views of the Irish and English coasts on that radar scope. I was too busy keeping it running to look out the windows of the plane."

Glenn had nursed the new radar, mounted in a lend-lease B-24, across the Atlantic in March of 1942 and spent the next few months flying sorties over the Irish Sea to evaluate the radar against fixed targets — or moving ones, like submarines.

The end result of this project was, of course, a commercial version of the short wavelength radar, one that was used widely by US forces throughout the War.

Back in this country, Glenn was assigned to the Pentagon — "they needed someone who knew radar systems" — for a couple of years.

## Manhattan Project

Knowing only that a man whose judg-

### Managerial Philosophy

*"I believe in giving promising people a chance to prove themselves early on. Let them try, let them grow, let them show their capabilities. If you control everything tightly from way up in the organization, you tend to condition them not to do anything unless they're told to. I try to give people a sense of direction and freedom of action. It lets good people show their stuff."*

\* \* \*

*Glenn's message to new supervisors was generally to "follow the rules and the regulations — they're there for your guidance. But don't let the rules make you do anything stupid."*

ment he respected, Norman Ramsey, thought he was needed more on a secret

project in New Mexico than in Washington, Glenn headed for Los Alamos and the Manhattan Project in early 1945. Within a week or two he was appointed secretary of the Weapon Committee, the group responsible for coordinating and guiding the frantic effort to have an atomic device ready for the Trinity test in July of that year. His major assignment during Trinity was to position the two aircraft that carried observers and instrumentation during the shot.

But Glenn was also getting a crash course in applied nuclear physics in weekly seminars and learning the engineering side of weaponry — for example, the delivery aircraft's suspension and release systems.

And, of course, he was getting to know Navy Captain "Deke" Parsons, who headed the Ordnance Division where Glenn was assigned; Commander Norris Bradbury, a member of the division, who later became director of LASL; and Robert Oppenheimer, head of the whole project. The latter made a strong impression on Glenn early...

"About two or three weeks after my arrival, I needed to talk with Oppenheimer about something. So I called his office and arranged with his secretary for an appointment. Maybe an hour later, he just walked

### One Final Test Drop

*"Just before we closed down the Salton Sea Test Range, some of our people there asked me to observe one more test drop. I had often remarked that we had used the range to drop everything but the kitchen sink. So, sure enough, that's what they dropped.*

*"It contained rolls of toilet paper that unrolled into streamers as they fell. And on the sink they had printed 'It Had To Come!' "*

into my office and said, 'I hear you want to talk with me.' Quite a change from the ways of the Pentagon!"

Glenn liked Los Alamos, so as soon as he could get away for a few days, he flew back to Washington, bought a surplus Army truck, piled furniture and wife Mary Alice into it, then headed west, marking progress by blown tires — one a day.

New Mexico, of course, became home to the Fowlers, but that didn't happen immediately. "You come here and you're not sure at all you're going to like it. Then you go away — maybe a trip Back East — and you come back and you say 'Wow. This is beautiful country!'"

"Of course, I love the outdoors and I found New Mexico was a relatively primitive place that I soon preferred to the heavily populated East."

### Sandia Base

In late 1945 Sandia Base (the place we now know as Kirtland East) was a repository for WWII planes awaiting their turn to become scrap metal. And the Manhattan Project needed a permanent operation in Albuquerque near an airfield like Kirtland. The nearly abandoned Base was a good site.

By November Glenn and Mary Alice had moved off "The Hill" and into Albuquerque. Glenn, as head of Test Operations, helped to set up a test lab on the Base "in a building that, unfortunately, still exists," he notes. His group had also located an area on the Rio Puerco west of Los Lunas that would serve as a bomb drop test range.

In the next year Congress passed the Atomic Energy Act, which marked the end of the Manhattan Engineering District and the end of the military control of nuclear weapons. It also marked the beginning of the Atomic Energy Commission with its prime contractors like the University of California operating facilities like Los Alamos Scientific Laboratory (and its Sandia Branch that served as LASL's engineering and test elements).

In the late 40s, the mission was clear — design, test and stockpile enough weapons to deter any adversary. The nuclear tests were typically surface or high-altitude events conducted in the Pacific to measure more precisely the performance and the effects of nuclear weapons. And "stockpile" meant a few hundred weapons, never thousands, in those days.

The Sandia Branch was scheduled to become an engineering and production facility until the University of California decided that a university should not be in the production business. So, in 1949, President Truman persuaded AT&T to establish a corporation to take over operation of Sandia Branch under a unique no-profit, no-fee contract. "My interpretation here," says Glenn, "is that memories of war profiteering were still strong in '49, and AT&T wanted to be seen as doing a public service, not as making money from weapon work."

And so was born Sandia — Corporation, it was long called; then Labs; now National Labs.

### Field Test

Glenn was promoted to Director of Field Testing shortly after the transition into the Bell System. His group was busy developing more efficient ways to test weapon designs and reliability. And Sandia, as a whole, was gearing up to be the production facility — in fact, that's why Bldg. 892 was constructed.

Obviously, that direction was changed, and production roles were parceled out to the several contractors now known collectively as the production complex. Sandia retained its role as an ordnance lab — take a nuclear device developed by LASL (or, later, Lawrence Livermore Lab) and turn it into a safe and reliable weapon suitable for military use. That takes systems and component designers plus support organizations.

Glenn's field test group provided much of that support. The group opened the Salton Sea Test Range in Southern California to learn how weapon drops would be affected by the denser air at lower altitudes — 250 feet below sea level in contrast to the 5000-foot altitude of the Los Lunas range.

Later, when Los Angeles smog and increased habitation of the area reduced Salton Sea's desirability as a test range, Glenn was involved in the selection of the

## Trinity

"I was in one of the two observer/instrumentation aircraft for the Trinity shot. We hit some terrific thunderstorm activity so we had to drop down from our assigned 23,000 feet to 18,000 or so and simply circle the site. I was sitting in the navigator's seat just behind the pilot, and since he naturally circled to the left, I had a front row view of the shot.

"It created the biggest fireball that had ever existed till then. And I remember thinking — it sounds corny now, I guess — 'Here's the start of a new era. We're releasing large amounts of energy in a way that has never been done before.'"

still-operating Tonopah Test Range as Sandia's bomb drop area.

### Research

Glenn's next job put him even more directly into the weapon development cycle: he was made Director of Electronics in 1954, a field for which his formal education had prepared him. "Our biggest developmental problem at that point was the electronic 'zipper' (or external initiator)," Glenn remembers.

That period didn't last long. In 1955 he was promoted to Vice-President of Research, "which was an unusual position for an engineer," he points out.

It was during the ensuing five-year period that Glenn — and Sandia — realized that the Labs needed people trained in applied and basic research. New concepts, like solid state physics, demanded people with new capabilities. Sandia needed to understand basic phenomena to do its engineering tasks. And Glenn soon discovered that even the people doing basic research needed to know where a given program was headed in order to answer questions like "Shall I take this direction for my research or that one?"

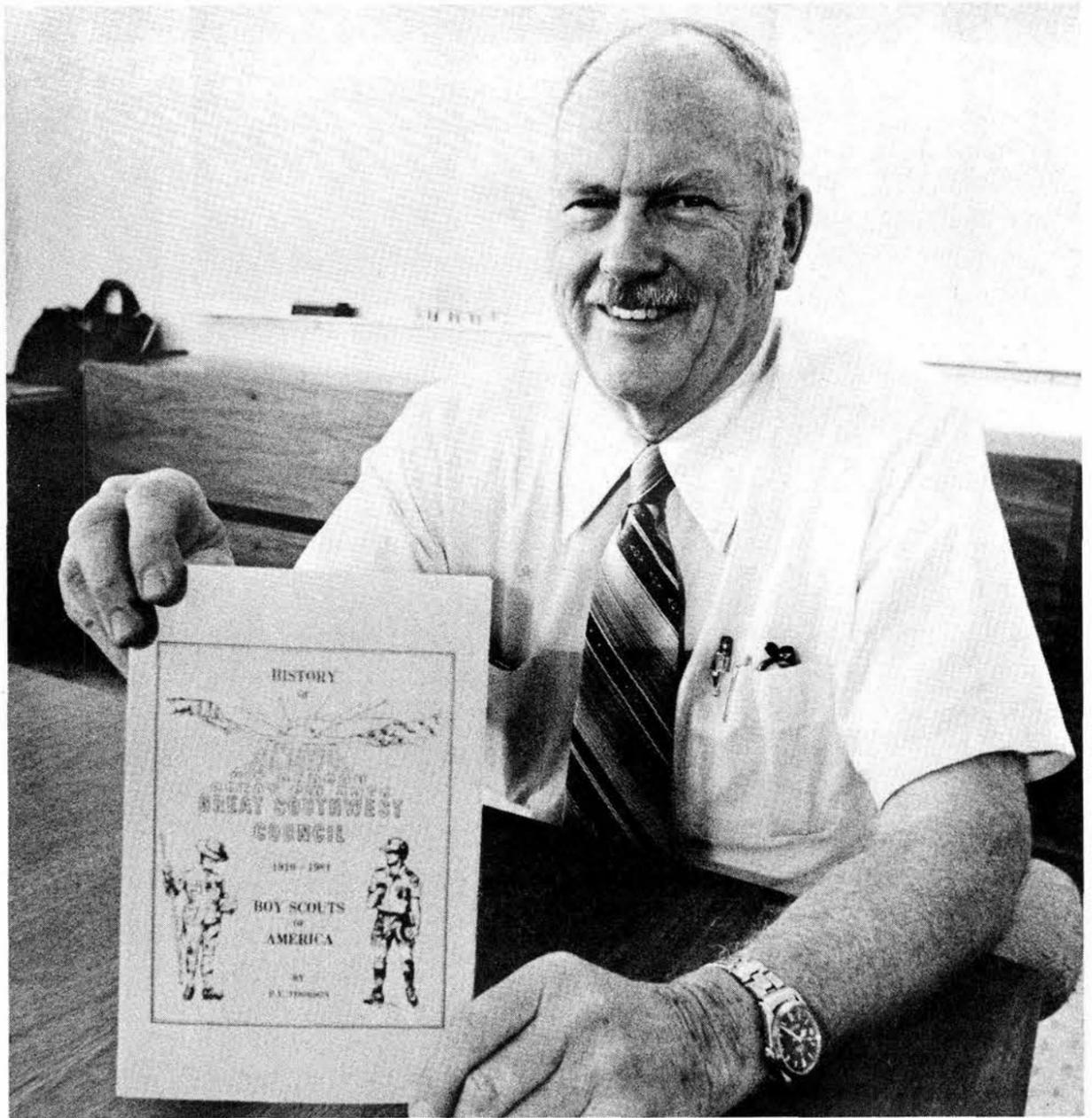
It was in this period, then, that he began holding organization-wide briefings so that everyone under him would have a clearer understanding of where the group was headed.

In 1960 Glenn headed the weapon development program in Albuquerque, and his acquaintance with the research program proved valuable in the new assignment.

### Diversification

After that, Glenn became Vice-President of Special Programs. (The testing function was added in 1971.) Through this period ('65-'73), Glenn's mission was to diversify — to seek new ways in which Sandia could (in such areas as reimbursable programs, for example) use its resources to contribute to the national defense and not remain tied solely to weapon development. During this time, Sandia's capabilities in monitoring nuclear blasts (the VELA program is a major example) strengthened considerably.

Space Nuclear Systems was another major responsibility assumed by Sandia. SNS involved program direction and safety analysis for reactor and isotopic power supplies for space, including the SNAP-27 power supplies used to power instruments left on the moon. Sandia designed and flew its first reentry bodies during this program.



YEARS OF EXTRACURRICULAR effort have gone into Glenn's work with the Boy Scouts. Here he shows off the new *History of the Great Southwest Council*, a book he edited (and keyed into his home word processor) between 5 and 6 each morning for several months.

In connection with the "McNamara Line" in Viet Nam, Sandia undertook a crash program to develop intrusion detection sensors. Developed and delivered in less than a year, these sensors established a reputation for Sandia that has led to a continuing program in various physical security areas.

Still another responsibility that Sandia took on in this period (after the Limited Test Ban Treaty in '63) was JTF2 (Joint Task Force 2). Its purpose was to determine the most effective method of locating a target while on low-altitude flights. Sandia's task was to evaluate a number of different systems for low-level reconnaissance and attack.

"It was a tremendous instrumentation job," Glenn recalls, "because telemetry and position-location systems on the ground couldn't see the low-flying planes. So we had to observe the delivery aircraft from C130s positioned above the targets, then compensate, in data reduction, for the location of the C130s in defining how well the delivery aircraft were doing.

"Interestingly enough, we found that success depended less on which delivery system was used than on the training and skill of the delivery crew."

Since 1973, Glenn has been vice-president of Sandia's systems organization, a collection of directorates that currently includes nuclear security systems, nuclear fuel cycle programs, energy programs, and weapon development.

### Non-Sandia Interests

Off the job, Glenn has found the time and

energy to help raise a family (two sons and a daughter), to engage in several hobbies (all outdoor-oriented, like fishing, kayaking, sailing, power boating, flying, and soaring — he set an official New Mexico altitude record of 28,300 feet in 1967), and to serve his favorite organization, the Boy Scouts, in a variety of positions. Many of those positions involved working directly with youngsters to get them into the outdoors, summer and winter, and teaching adults how the program was designed to run. But his most recent contribution was to edit the definitive history of the Great Southwest Council, the body that coordinates scouting activities throughout this area.

### Looking Back

"I know it sounds hackneyed, but this has been a rare experience. I feel sorry for my kids' generation — they are not having the experiences and the challenges I've had. It's a different world — when I began, we faced a common threat, and we knew we had to put forth everything we had to overcome it. Our view of the world now appears much more restricted — we don't seem to have a common goal, a common purpose, anymore.

"Maybe what we need is a non-destructive cause into which to channel our energies and our natural rivalries — something like what Kennedy tried to do in the space race.

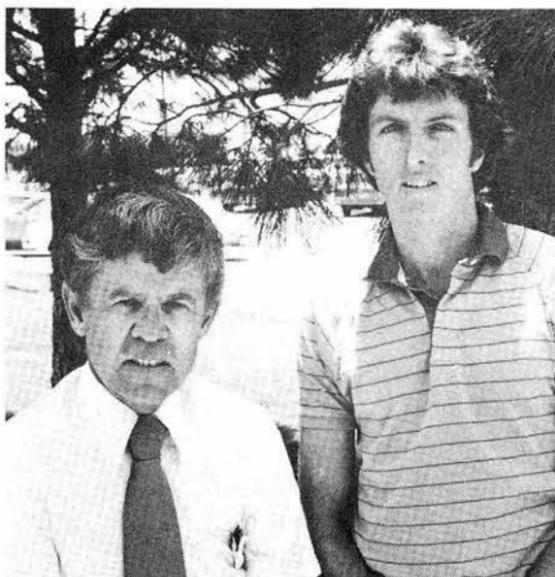
"I have a real sense of pride in Sandia — it's a first-rate technical outfit with high integrity, a good place to work."

### And Looking Ahead

"Some stream fishing, some sailing — and a lot more time with Mary Alice."



CHUCK LADIG (7481) and PETE SEWARD (7135)



DICK PRAIRIE (7220) and LARRY WALKER (7322)

## Supervisory Appointments

CHUCK LADIG to supervisor of Machinist Apprentice Training Section 7481-4, effective April 16.

Chuck joined Sandia in 1954 as a machinist trainee. In 1960, he graduated from the first machinist apprentice training program. Before coming to the Labs, Chuck had worked for the Santa Fe Railroad.

He enjoys almost any outdoor activity — hunting, fishing, camping, and golf. Chuck and his wife Beverly have two children and live in NE Albuquerque.

\* \* \*

DICK PRAIRIE to manager of Reliability Department 7220, effective May 16.

Dick joined the Labs as a statistician in the Reliability Department in February 1962. In 1966 he was promoted to supervisor of the Statistics and Computing Division. During the mid-70s, the division was enlarged to include the human factors function. Until his present promotion, Dick headed the Statistics, Computing & Human Factors Division 7223.

He received a BS in math from the University of Minnesota and his MS and Phd in statistics from North Carolina State. He is a member of the American Statistical Association.

Dick has many interests off the job — skiing, tennis, raising bees, gardening, camping, and traveling. He is currently on a two-week Friendship Force trip in Egypt and a week's vacation in the Holy Land.

Dick has three college-age children; he lives in the NE heights.

\* \* \*

LARRY WALKER to supervisor of Satellite Sensors Division 7322, effective May 16.

Larry has been a staff member with the division he now heads since coming to Sandia in June 1977. His work has been with satellite systems.

He received his BS and MS from Oklahoma State University. Larry enjoys skiing and jogging; he also plays softball with a city league and basketball with a Sandia team. He's also one of Sandia's representatives in the annual Corporate Cup Relays. Larry lives in the NE heights.

\* \* \*

PETE SEWARD to supervisor of Field Support and Logistics Division 7135, effective May 16.

Since joining the Labs in 1955, Pete has worked the entire time with the field test directorate. His work has required a tremendous amount of travel — "I gave up counting how many trips I've made to Hawaii."

Pete served in the Navy for two years and attended UNM. He enjoys golf, and he's studied classical guitar for three years. (He didn't add travel to his list of off-the-job interests.) Pete and his wife Barbara live in NE Albuquerque and have three grown children and one grandchild.

\* \* \*

### Based on LIFE Magazine

## Movie on Women's Place Set

Sandia's Women's Program Committee will host the showing of the film "A Woman's Place." All interested Sandia employees are invited to attend. Invite a friend and bring your lunch. The schedule by organization:

Date: June 15  
Time: 11:30 a.m.  
Organizations: 1000, 2000, 3000

Date: June 17  
Time: 11:30 a.m.  
Organizations: 6000, 7000, 9000

The 25-minute film is an inspiring documentary based in part on material gathered for *Life* magazine's special report, "Remarkable American Women." The film hails notable women and celebrates the fact that today a woman's place is every place. The film can help viewers explore and develop new, fuller life goals. "A Woman's Place" does not deal with legislation, the women's lib movement, or attitudes regarding women and careers. The film does demonstrate that women can achieve success in all phases of work and life.

## Fun & Games

*Bicycling/Backpacking/Canoeing* — Three "Treks for Life and Breath" are being offered this summer by the American Lung Association: The Third Annual 100-Kilometer Backpacking Trek in the Pecos Wilderness, July 9-16; the inaugural 60-mile Canoe Trek on the northern Rio Grande, August 6-8; and the Second Annual 200-Mile Bike Trek through the Jemez Mountains. These treks will offer outdoor adventure, an inexpensive, pollution-free vacation, and a way to raise money for the American Lung Association of New Mexico. Novices as well as veterans are encouraged to participate. The Lung Association provides food, training, transportation/support vehicles, supervision, and rental referrals for the Treks. For more information, contact the American Lung Association of New Mexico, 216 Truman N.E., Albuquerque, N.M. 87108 or call 265-0732.

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*Arts & Crafts* — KAFB Arts & Crafts announces the following classes: auto maintenance begins June 13, 6-9 p.m. at Auto Shop; oil painting begins June 15, 6-9 p.m. at A&C Center; sculpture welding began June 6, 6-8:30 p.m. at Auto Shop. Call 4-0222 for info and signup.

\* \* \*

*Clogging* — The Sandia Mountain Cloggers happily announce that Dennis Huffman, clogging teacher extraordinaire, has just been hired by Sandia. The next clogging class is scheduled for September, but clogging activities will go on through the summer on Mondays and Wednesdays at the YMCA, 4th and Lead. For more info, call 4-1477.

\* \* \*

*Tennis* — Thinking about brushing up on your tennis skills? The Sandia Tennis Assn., in conjunction with the Albuquerque Tennis Complex (1903 Stadium, SE), will offer intermediate tennis lessons on June 28 and June 30 (5:30-7 p.m. each day). Lesson fee is \$4 per person. For more information call Terry Holovka (4-0872) or Margaret Chavez (6-4627). Advance registration is due by June 22. STA is subsidizing half of the fee, so STA membership is mandatory. STA membership fee is \$1.

### A Chance To Do Your Shtick!

As part of next year's Employee Contribution Plan campaign, an employee variety show will be held Oct. 3 during the lunch period on the library mall. This will be an all-Sandia show, and the ECP Committee urges all talented and/or stagestruck individuals and groups to participate: MCs, singers, musicians, skits, magicians, comics, etc. The show should be a lot of fun for the performers as well as for the audience. Entry forms can be obtained from Ellen Cronin (9041) at 4-7019.

### Congratulations

Liz Scott (3153) and Paull Patterson, married in North San Juan, Calif., May 14.

Susan Harris (3330) and Mark Percival (9734), married in Albuquerque, June 2.

Gabriel (2457) and Shirley Romero, a son, Justin, May 23.

Nadine Archuleta (2426) and Edward Williams, Jr. (3615), married in Albuquerque, May 28.

## **A Marathon, Not a Sprint**

The Particle Beam Fusion Accelerator-I group has gone on a double-shift schedule — from 5 a.m. to 10 p.m. — with each shift working a maximum of 10 hours.

And why this furious activity? "We're running a marathon in the fusion race — not a sprint," says Steve Goldstein, head of Pulsed Power Operation Division 1254. "To achieve DOE milestones, we have to keep up the present pace until at least 1987 or 1988 to attain 'breakeven' on PBFA-II when it goes on line. Breakeven means that we produce as much energy as is contained in the light ion beam. The objective of the PBFA program is to ignite a pellet filled with deuterium and tritium to achieve fusion."

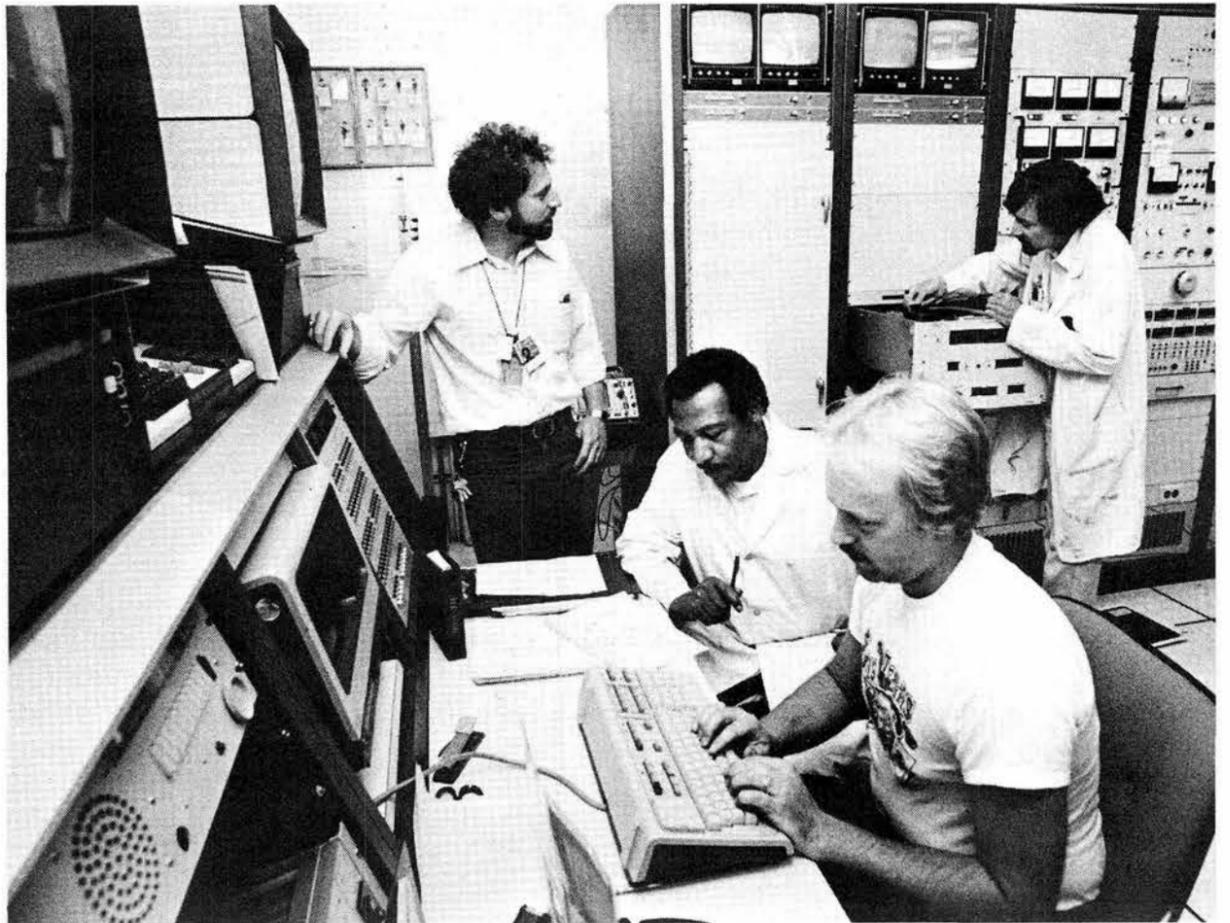
Sandia has the only permanent staff devoted to operating a super-power generator, which is the buzz word for an accelerator with several trillion watts of output. Such generators are also multimodular since, explains Steve, "we don't know how to make trillions of watts using just one module — PBFA-I is a 36-module machine.

"All other groups I know of are mostly *ad hoc*. We, on the other hand, have continuity so we avoid making the same mistakes over and over again. Super-power generators tend to be physically large — Gerry Yonas likes to call this field 'macro-electronics.' Because they're large and complex, it's not obvious how such a machine should be run. How many people? How many spare parts? What's the most efficient way to run it?"

When PBFA-I was first fired in June 1980, each experiment took 2½ weeks to set up and run because so little was known about the technology. Today, Steve's group, headed by Gary Peterson, G.T. Holman, and Bill McAtee, runs one shot a day, four days a week. A permanent crew schedules the sequence of events: preparation of the "high bay" — the building that houses PBFA; and setting up various subsystems — diagnostics, control, and data acquisition, headed by Steve Chaba and Frank Bouchier. Experiments are conducted between 2 and 6 p.m. from Monday through Thursday. Friday is "operations engineering day," when the crew fixes and improves the facility. Occasionally, Saturday operations are necessary. This schedule also places rather heavy demands on several Sandia support services.

It takes up to 17 hours to set up a shot, each of which lasts for 35 nanoseconds. For such extremely short periods, the PBFA can generate up to 15 times the total world power output. But in that brief time, enough data are generated for weeks of analysis. During 17 or 18 hours of operations, the crew includes 24 contractor technicians, headed by Harry McGovern and Al Schmidlapp, from various local firms, along with 7 Sandia technicians and 10 staff members from other divisions. One experiment can use up to 40 people.

To improve reliability, Dennis Nations, (1254) and Jim Spiller are automating various systems that operators and experimenters must now monitor. "The ma-



A PBFA experiment or "shot" requires many hours of preparation necessitating a double-shift schedule, recently implemented. Here is the pulsed power operation crew during a busy moment in the control room. From the left, Division 1254 chief Steve Goldstein, G.T. Holman, Dennis Nations, and Gary Peterson.

chine's complexity is rapidly exceeding the human ability to run it," says Steve. "PBFA-I is the first super-power generator in our program to have automated control monitor systems.

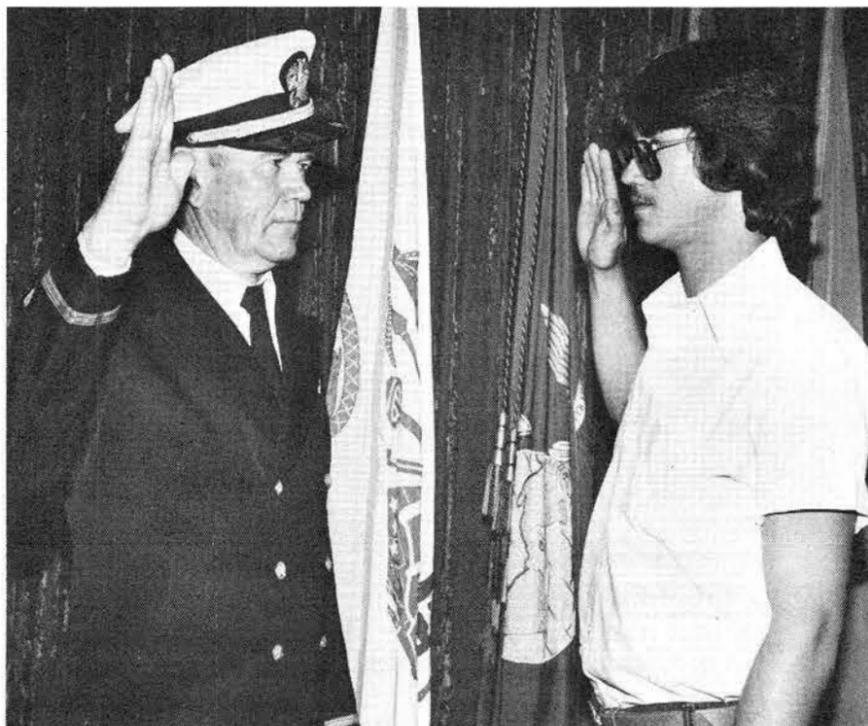
"Perhaps in another six months we'll have the capability to prepare and fire accelerators in a totally automated fashion. The analogy to a space shuttle launch is very close. There's a clock in the control room and a system that controls the sequence and operation of the high bay. Any time something isn't quite right, we'll stop the clock, locate and fix the problem, and then restart the clock."

"Success is very sweet when everyone's contribution is properly orchestrated,"

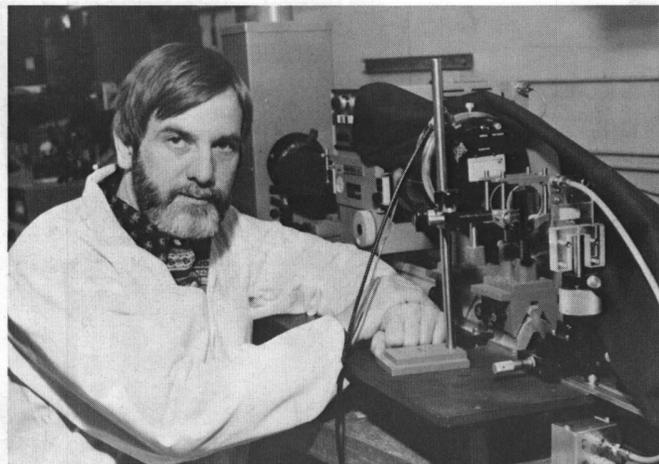
says Steve. "The shot comes off and we learn a lot. Failure is pretty bitter — one small mistake and everyone else's work is wasted. That's why operating hours are so long — to minimize the chance of a mistake.

"The accelerator costs about \$1000 an hour to run — each experiment costs upward of \$100,000. It *can't* be done inefficiently or we'll literally spend the program out of funds." Yearly program operating budget is \$20 million. PBFA-I takes about \$3 million.

Concludes Steve: "The PBFA facility isn't a place for cautious, conservative people. It's a place for those who are willing to be daring and innovative, for people with a lot of energy themselves."



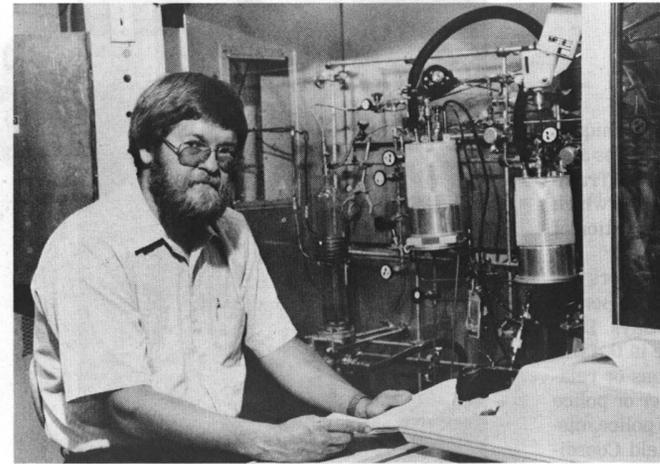
CYRUS HALL (9311), left, a retired U.S. Navy CW02, officiated at his son Jeffrey's swearing-in ceremony recently. Jeffrey is going into active duty now after completing 20 months of diesel training under a Navy educational program. He will be a gas turbine technician. Cyrus enlisted in the Navy in 1939 when he was 17 and spent 22 years on active duty. In WWII, he saw action in all three combat theaters.



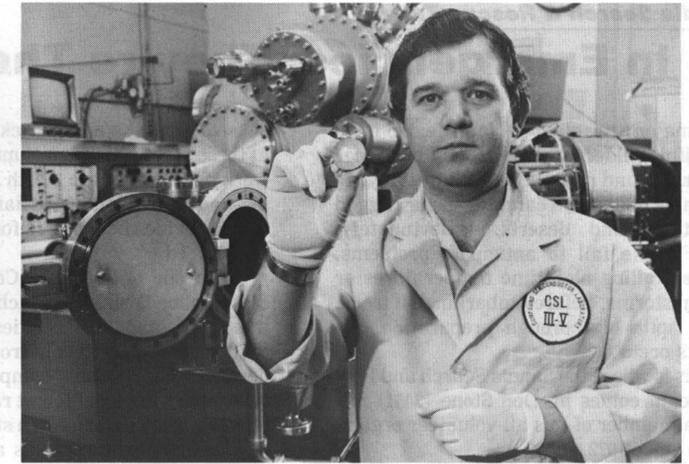
PHYSICIST Ian Fritz (1132) with photocurrent measurement apparatus.



ELECTRICAL ENGINEER Tom Zipperian (1141) with device measurement equipment.



CRYSTAL GROWER Bob Biefeld (1154) grew the first SLS material at Sandia on this metal organic chemical vapor deposition apparatus.



CRYSTAL GROWER Ralph Dawson (1141) with a molecular beam epitaxy machine and a sample of SLS.

Continued from Page One

## SLS

the Periodic Table of the Elements, for example, gallium arsenide phosphide (in addition to the commonly used gallium arsenide), indium gallium arsenide, and others.

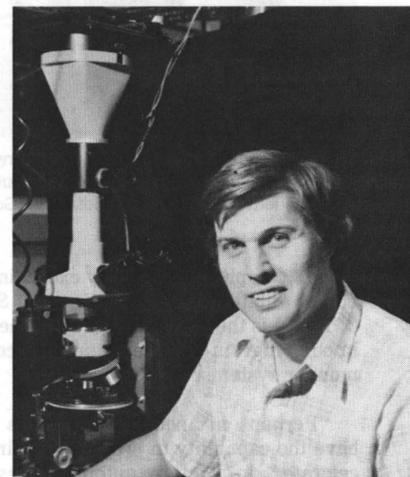
SLS crystal layers are now being grown at Sandia by means of two specialized processes — molecular beam epitaxy (MBE) and metal organic chemical vapor deposition (MOCVD). These are not generally used to mass-produce electronic devices. However, recent progress in producing high-quality SLS materials with these methods makes the researchers confident that SLS materials can eventually be produced in commercial quantities.

SLS work to date has been concentrated on theoretical studies, growth of materials, and measurement of electronic and optical properties. Only very simple semiconductor devices — diodes — have so far been produced. However, the Sandia team believes that many new devices will ultimately be developed using SLSs, evolving first along lines that currently are not well served by conventional materials such as silicon. For this reason, the initial emphasis is likely to be on opto-electronic devices rather than, for instance, on integrated circuitry.

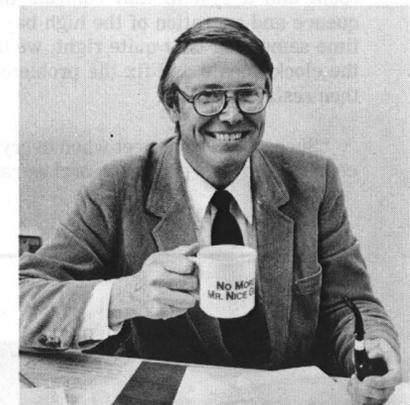
"With development, one exciting goal for SLS devices would be to generate a green solid state laser" says Fred Vook (1100).

That goal and several others await further research and development of the new technology necessary to harness the potentials of SLS.

The research team includes Gordon Osbourn (1141), who performed the pioneering theoretical work at Sandia (see related story on SLS history); Bob Biefeld (1154), who grew the first SLS material at Sandia; Roger Chaffin (1140), devices; Ralph Dawson (1141), crystal growth; Ian Fritz (1132), electronic measurements; Paul Gourley (1132), optical measurements; Tom Picraux (1111), structural studies; Jim Schirber (1150), electronic measurements; and Tom Zipperian (1141) device studies. Several other Sandians in the directorate — notably, James Wiczer, Charles



PHYSICIST Paul Gourley (1132) in the optical measurements lab.



ROGER CHAFFIN, manager of Device Research Department 1140.

Barnes (both 1142), David Myers (1141), and Paul Peercy (1110) — are also contributing substantially to the SLS development program.

Says John Galt (1000): "Strained-layer superlattices appear to be a major advance in semi-conductor device science. The discoveries are very recent, and the basic properties of various SLS materials are still being explored so that we can achieve a better idea of their potential for actual device applications. Nevertheless, we are confident that they will prove valuable in the design of improved electronic systems that we are developing for DOE's weapons program."

### Theory of SLS

## Secret Is Thinness Crystal Layer

Work on SLS materials follows three decades of the "transfer revolution," in which silicon chips became part of every aspect of modern society, from the pocket calculator to the super-computer. Silicon has proven so spectacularly successful that scientists and technologists have "engineered around" its limitations for decades. In recent years, however, there has been a renewed drive to make use of other semiconductors with material properties unavailable to silicon — to make devices faster, to make them work under more demanding temperature conditions, to make them responsive to a wider range of voltages, to make them emit or respond to new wavelength ranges. SLSs have the tailorable material properties that make them especially suited for such applications.

The answers to these challenges lie deep in the microscopic structure of the silicon, gallium arsenide, and other crystalline materials that are classed as semiconductors. The composition and physical dimensions of the cubes and tetrahedrons (unit cells) that make up their lattice structures determine their basic material properties.

During or after growth, a material (such as silicon) is converted into a device by adding impurities to one or more regions of its bulk; by adding conductive layers where needed; and by providing the structure with electrical connections. Fixed sets of electronic properties are associated with each type of structure, whether it is made from a single component semiconductor such as silicon, or a compound semiconductor such as gallium phosphide. These can be altered somewhat with the addition of impurity "dopants."

Each conventional semiconductor type therefore must operate within the constraints of its own bandgap, e.g. 1.1 eV for silicon and 2.3 eV for gallium phosphide. With SLS materials, on the other hand, this bandgap can be tailored; for example, it is possible to design SLS semiconductors that will operate at any point from the 2.3 eV bandgap typical of BaP to the 0.36 eV typical of indium arsenide.

In structures with two or more thick semiconductor layers, mismatches of the type common to SLS structures would re-

sult in damage — misfit dislocations — which quench the desirable electronic and optical characteristics of these structures. However, the SLS layers are so thin that, instead of generating damage, they accommodate the mismatch by layer strains — the unit cells which make up each layer deform, matching with those in adjacent layers. These strains open up the possibility of producing a vast new range of semiconductor materials that, though they are made of many mismatched layers, function like high-quality single-crystal materials.

The SLS consists of many thin layers of alternating, strained single-crystal semiconductor types, typically the more common compound semiconductors such as gallium arsenide phosphide (GaAsP) and gallium phosphide (GaP). The lattice mismatch is accommodated entirely by uniform lattice strain as long as the layers are sufficiently thin — i.e. up to 250 angstroms for a 1.8 percent mismatch. (There are 100 million angstroms in a centimeter and 254 million in an inch; a GaP unit cell will measure on the order of 5.5 angstroms along the side.)

The outstanding characteristic of SLS technology is that it makes it possible to "tailor" semiconductors so that they may have any of a very wide range of desirable properties. For instance, it is now possible to predetermine the bandgap of an SLS structure so that it occurs anywhere in the indium arsenide-gallium arsenide range (0.36 to 1.43 electron volts), by adding gallium at the expense of indium as the bandgap requirements increase. From this point, the bandgap can be set in the 1.43-2.3 eV range by adding phosphorus to a basic GaAs structure at the expense of arsenic. Other compounds would allow other electronic properties.

In photodiodes and photodetectors, these discrete bandgaps are associated with specific ranges of wavelengths of light to which the device is made sensitive.

Most important, SLS technology makes it possible *independently* to tailor the structural, transport, and optical properties of semiconductors in an almost infinite number of combinations.

### History of SLS

## From Theory to Reality

The structural and mechanical theory underlying strained-layer superlattices has existed in the literature for a long time. A structure based on the theory was first attempted by Gene Blakeslee of IBM in 1970. The attempt was unsuccessful, apparently because the structure contained many defects.

Later studies by Blakeslee and his co-workers showed that these defects might be prevented by closely matching the lattice constant of the superlattice to that of the substrate material on which the superlattice is grown. However, despite this early work, the first theoretical calculations, growth of high quality material, and measurements of the electronic and optical properties of SLS have been made here at Sandia.

"I began some follow-up studies based on Blakeslee's work in late 1980 when I realized that — if the lattice layers were very thin — they would 'strain' so that their atoms would arrange coherently rather than generate defects," says Gordon Osbourn (1141).

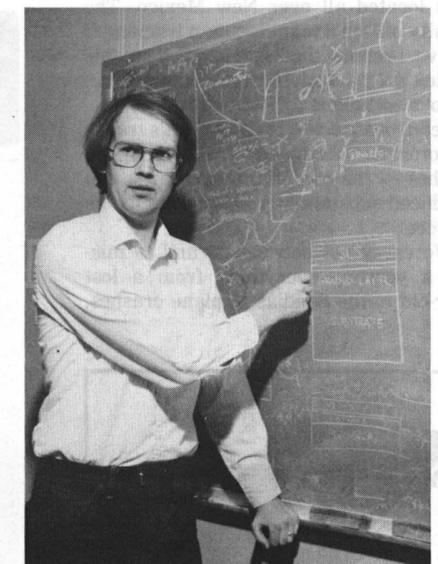
"I also saw that these coherent strains could lead to high-quality structures, structures with most interesting electronic, electrical, and optical properties. Such structures had not been studied in any way.

"Finally, I realized that, if these assumptions were correct, we would be free to choose materials that were *not* lattice-matched to make devices. That freedom would give us enormous flexibility, for there are a huge number of those potential structures."

Osbourn's theoretical work involved detailed quantum mechanical calculation of the effects of material type, crystal orientation, and strain effects on the electronic properties.

The first person to grow an SLS material at Sandia was Bob Biefeld (1154) in the spring of 1981. "The real excitement started when Bob actually grew a strained-layer superlattice," continues Gordon.

At this point, Paul Gourley (1132) and Ian Fritz (1132) were able to demonstrate that the SLS material, when tested and analyzed by several methods, proved to have



PHYSICIST Gordon Osbourn (1141) performed the pioneering theoretical work that led to Sandia's SLS materials.

the properties that Gordon had described earlier. The theory was now reality.

This first sample was a gallium arsenide phosphide SLS grown by the metal organic chemical vapor deposition method. And it worked.

Since then Sandia's lead in SLS development has been preserved. One patent disclosure was filed in 1981, three more in 1982, and two — so far — in 1983.

It's important to note that Sandia is not claiming credit for *inventing* the superlattice, but we do claim the strained-layer electronic and optical properties innovation (while, of course, crediting Blakeslee with having foreseen and devised certain mechanical and metallurgical applications). Our primary claim is that we have opened up the electronic and optical properties of superlattices to a broad range of potential applications by intentionally varying — with the strained-layer effect — the material properties of the structures.

## In Emergencies, They're There

A major attraction of New Mexico is its beautiful wilderness areas. With proper equipment and precautions, almost anyone can enjoy hiking and camping in our rugged mountains and deserts. Unfortunately, some people fail to anticipate problems, such as falling nighttime temperatures or sudden storms, before embarking on treks. Or in spite of thorough preparation, accidents occur.

This is where the Sandia Search and Rescue Team comes in. Don Stone (3451) has been a member of this all-volunteer organization since 1972.

Out of 26 members in the Sandia Search and Rescue Team, 19 are Sandia employees and two are retirees. "Sandia's very good about allowing employees to take up to three days with pay to participate in a rescue mission," says Don.

There are about 30 search and rescue teams located all over New Mexico. The specialty of Don's team is "man tracking."

"I've become the local expert on this complex art," he says. "Tracking is a tremendous technique for finding lost people. If we can locate a few of the victim's tracks — footprints, flattened grass, snapped branches — the potential search area can be reduced substantially — by as much as 90 percent."

"We carry out between 25 and 30 missions a year — everything from a lost 2-year-old in the Sandias to plane crashes,

several workshops on tracking techniques at these meetings. The volunteer teams also work closely with the 1550th Aircrew Training and Test Wing at Kirtland AFB, which often provides helicopters for evacuation of the injured.

"I'm one of six Field Coordinators for State Police District 5, which covers Bernalillo and Sandoval counties," says Don. "When somebody gets in trouble in the wilderness, that person's companions or relatives notify the local forest ranger or police officers. They in turn call a state police mission initiator who contacts a Field Coordinator to run the mission. By law, the state police have responsibility for search and rescue. Although they are nominally in charge, most of the work is done by volunteers."



TRACKING can be a life-or-death matter. Here Don Stone (3451), a skilled practitioner of the art, observes a broken stem on a plant which indicates to him that a lost hiker trod this way. Don is in the all-volunteer Sandia Search and Rescue Team that has 19 Sandians in its 26 member total.



hang glider accidents, lost cross-country skiers, and suicide victims who jump off cliffs. Spring is an especially dangerous time because of sudden temperature changes and unexpected snow and ice — particularly on the La Luz Trail. Someone caught unprepared is usually underdressed and vulnerable to hypothermia."

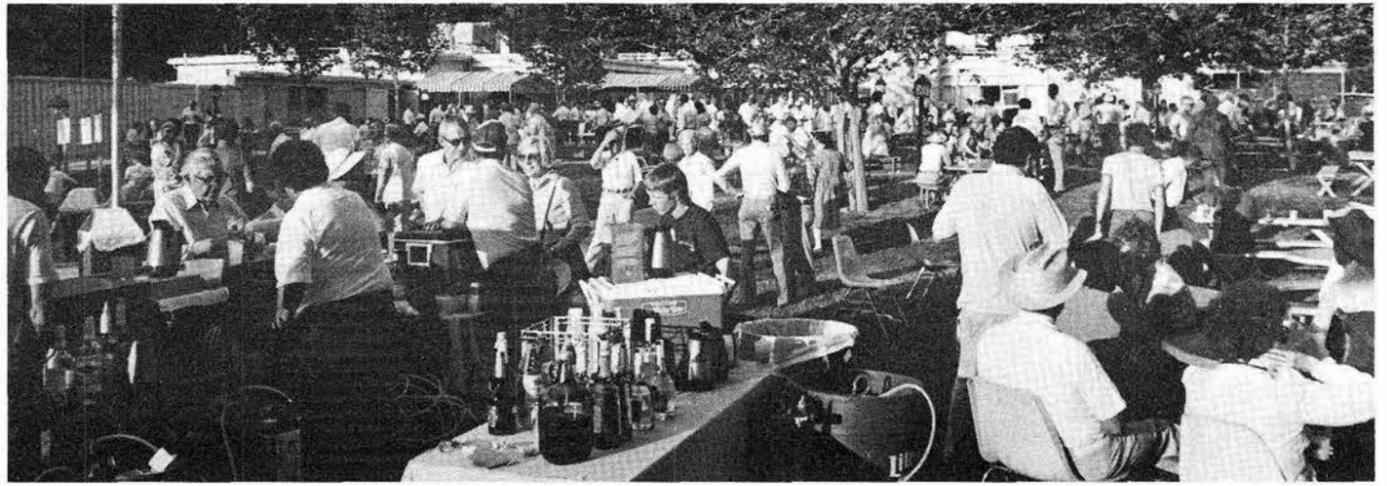
The team members purchase their personal equipment such as radios, backpacks, boots, clothing, and four-wheel-drive vehicles. They do not engage in fundraising but do accept donations for purchase of ropes, litters, and first aid supplies. The state reimburses them for gasoline.

A statewide training session, which draws between 150 and 200 participants, is held yearly by the New Mexico Emergency Services Council at Philmont Scout Ranch. Several other training sessions are held during the rest of the year in different localities. The Council is made up of the 30 or so teams in the state. Don has conducted



CRYOGENIC STORAGE — A review of cryogenic storage vessels at Sandia containing liquid hydrogen, nitrogen, argon, oxygen, and carbon dioxide showed some safety hazards and significant product loss. Plant Engineering is taking the lead role in correcting these problems. A contractor has been selected and is currently working on the tanks; all modifications are scheduled to be complete by February 1984. The program should result in a cost savings of \$100,000 annually. Mike Quinlan of Building and Facilities Design Division 3643 is project coordinator.

# Retiree Picnic '83



Some 1300 Sandia retirees and their spouses returned to the Coronado Club to enjoy good food and drink and talk about then, now, and tomorrow. Despite the threat of rain, it was a fine afternoon.



Ruth Lilley, now 83 years old, was brought to the picnic by her daughter who drove here from Arizona for the occasion.



The women who handled Sandia's payroll enjoyed the reunion. Seated are Lois Swaze, Joy Cannedy, and Edna Bierner. Standing are Willa Urbanoski and Flo Burch (3421), a guest, and Eleanor McPhate.



Kernie Kirsten



Harold Neuhaus



Dan Vallejos



John Kay and John Scott



Mike Michnovicz (2432) played accordion while Lucy Sanchez sang the old songs (as did almost everyone else).



Bert Quelle



Al Dadian



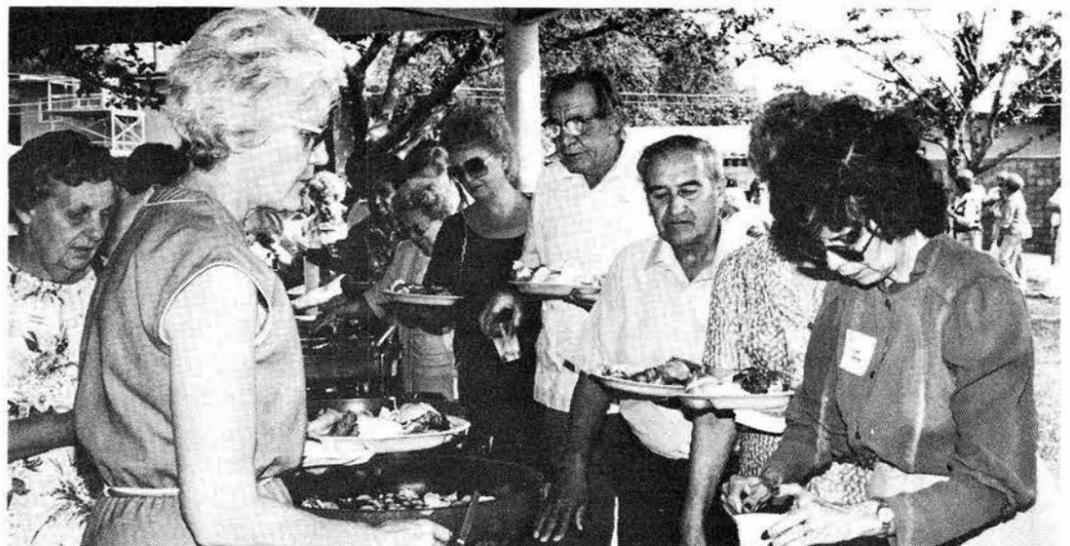
Carle Hunt



Bob Reed



Charlie Campbell (left) and Ted Sherwin (right)



Food was good and appetites were great.

## **ESA Trainees Graduate**

Last week 46 current and past graduates of the Engineering and Science Assistant Trainee (ESAT) program were honored at a banquet luncheon sponsored by the Education and Training Department 3520. With the successful completion of the program, these graduates (47 trainees have graduated from the program since its inception in 1974) received a Technical Institute Equivalency (TIE) Certificate and became eligible for reclassification as ESA-Is.

The TIE program provides employees at the Labs the opportunity to take courses in one of seven curricula that lead to a TIE certificate, enabling them to become eligible for ESA-level work. These seven are: electronics, drafting and design, mechanical, electro-mechanical, materials, information systems, and numerical control programmer. The curricula for each program are structured to adhere to the standards of the Accreditation Board for Engineering and Technology, the official national organization that accredits college level engineering associate degrees.

To enter the ESAT program, an employee must complete four or more courses in one of the TIE disciplines. The employee may then bid on the trainee openings announced annually in the Weekly Bulletin.

Nick Magnani (1840) is the ESA Trainee Program Supervisor; Mary Tang (3521) administers both the TIE and ESAT programs. She works with line organization supervisors, instructors, education committees, and students to set up the required course work. ESA trainees usually enroll in two courses per semester for four years. They also receive on-the-job training in jobs that relate to their academic programs.

Of the 47 graduates, 46 are still on-roll at the Labs, and seven of those graduated last month. (About 60 percent of ESAT graduates are minorities or female.)

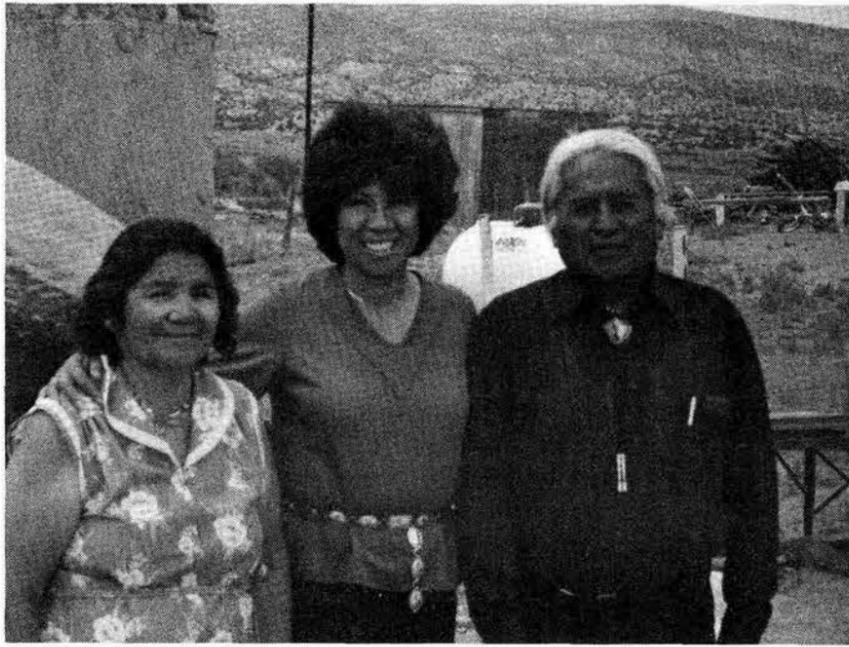
"The ESAT program is a real challenge," Mary says. "Anyone who completes it should be proud of the accomplishment."

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tions with the pueblo. At home, we prefer to eat in the Chinese way — lots of rice and stir-fried vegetables. But both cultures have a 'sense of family' and the children are learning that."

At Sandia, Mary is an administrator for two programs — the Technical Institute Equivalency Program and the Engineering and Science Assistant Trainee Program. She is a counselor and is a member of the Indian Outreach Committee.

Her future plans? You guessed it. More school. "Sandia offers so many interesting out-of-hours courses," Mary says. "My next step is to start taking some computer courses at Sandia and under the Education Aids Program. I feel that would round out the education I need to really help me in what I'm doing at Sandia."



BACK HOME at Jemez Pueblo, Mary Tang is flanked by her mother, Amelita, and her father, Jose Rey Toledo.

### **Congrats, Mary Tang**

## **Education, Life Interlocked**

People have all kinds of hobbies. For Mary Tang (3521), the hobby has been college courses. She entered UNM as a freshman in 1964; three weeks ago she received her PhD.

Mary is a Jemez Indian. Her father is the well-known artist Jose Rey Toledo. He set the pattern that Mary and her six brothers and sisters followed.

"Dad expected us to do well," Mary says, "but he never demanded — he just set the example. After the seven of us were born, he earned a master's degree in art education and a second master's in public health service. Even now, at age 67, he's talking about a PhD."

Mary's father worked for the Bureau of Indian Affairs and the Public Health Service; about the time Mary began junior high, he was transferred to North Dakota and later to South Dakota. Mary graduated from the Sioux Indian Reservation school system.

"Living on the Sioux reservation was different from living in the pueblo," Mary recalls. "The Sioux had a very good command of English, while at that time, the pueblo people used Spanish more than English. Another difference — the pueblo people, with their agrarian culture, were more self-sufficient, while the Sioux held long-standing treaties with the government so they were more dependent on the government. Of course, these comparisons aren't true today."

Mary's family returned to Jemez and she enrolled at UNM, where she graduated in 1968 with a BS in biology. A year and a half later, in the fall of 1970, she started her graduate program. She received her MA in educational foundations in December 1971 and immediately began work on her doctorate. She completed the course work and exams in 1974, but by this time, Mary's personal life had to take precedence over her academic life. She had earlier married Richard Tang, a naturalized U.S. citizen from China, and the couple now had two children — three-year-old Amy and infant Daniel. They also had Richard's elderly grandfather to care for.

"It was a difficult time," Mary says. "I had so many responsibilities that it was hard to find time to work on my disserta-

tion, which involved many field trips and interviews and a good deal of research."

Four years ago, Mary came to work at Sandia. She completed her dissertation, "A Descriptive Study of Bilingual Education in Three Pueblo Communities," in April of this year, and on May 15 she received her PhD in education.

"When I think back over the past year," Mary says, "I realize that it was a very spiritual experience. It amazes me that we are given minds that can handle so much."

Most of Mary's graduate courses were in linguistics and sociolinguistics. They provide a basis for her concerns about Indian education.

"Many Indians now speak English," Mary says, "but they tend to use their native language pronunciations and other speech patterns, so sometimes communication with non-Indians can be difficult."

"Then too, pueblo life is changing. In my studies of linguistics, I found that pueblo languages are tied to tradition and culture, and these in turn, are tied to religion. These factors interlock and create the environment in which the language and culture exist. For Indian youth today, with their exposure to life outside the pueblo, it's difficult to maintain the strong feelings that it takes to nurture this complex union. As a result, the young people often leave the pueblos."

"On the other hand, there's a common feeling among other Indians that the pueblo people's culture has remained more intact than that of other tribes. I think this may be true, because many of those who leave the pueblo when they are young seem to return later in their lives, perhaps not to the pueblo itself, but to live in the vicinity of their former homes. The interaction between these people and the pueblo is very evident."

Mary and Richard's children live in this modern world and yet benefit from the two ancient cultures that are their heritage. Mary's parents are retired and live at Jemez Pueblo. Her father travels the country to speak about art and his native culture. Richard's parents are retired and live in Phoenix.

"Our children often spend time with their grandparents. They are both learning to speak Chinese, and they have close rela-

## Take Note

The Albuquerque Museum announces "Cinema New Mexico" — a summer series of films made in or about New Mexico. The program is being presented in conjunction with the new permanent history exhibit, "Four Centuries." Showings will be on Wednesdays at 3 and 7:30 p.m. On June 15, the three afternoon films will be *Magic Tree: A Story*, *Anasazi the Spider*, and *The Legend of John Henry*; the evening program will be two weaving films, *Weaving with Looms You Can Make*, *Aguedo Martinez* and *Los Tejedores*. Admission is free.

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The Elks Lodge will have a Flag Day program on June 14 at 8 p.m. The keynote speaker will be New Mexico adjutant general Maj. General Ed Baca. Admission and refreshments are free; the place is 1642 University N.E. Call Floyd Elder on 4-7578 for more info.

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If you believe an altimeter is a device used to measure women's low voices, read on. The Ensemble Pro Musica is looking for interested singers to audition for solo parts in works to be performed during its upcoming season — Mozart's "Great Mass in C Minor" and Rossini's "Stabat Mater." The chorus and soloists are accompanied by members of the New Mexico Symphony Orchestra. Auditions for solo parts are June 22 at 7:30-10 p.m. at the First Congregational Church on Lomas and Girard. More info from Juliette Williams, 884-3603. Other singers interested in joining the chorus should also contact her.

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The Bernalillo County Mental Health/Mental Retardation Center's Inpatient Units Swim Program is about to sink! All because they are in need of swimming suits for the patients. When you replace your summer swimwear, please remember to toss your old suit their way. All adult sizes and styles can be used, although they need to be of the more modest type. Contact Fred Hansen on 4-7502 or call the BCMH/MRC Volunteer Office at 843-2811. The patients, staff, and volunteers appreciate your help in getting them back in the swim.

\* \* \*

The Purchasing organization filled a typist opening two months ago when Sandia hired Myrleen Post (3733). However, Myrleen isn't an ordinary typist. Western Temporaries, her former employer, sponsors an annual typing contest; Myrleen won the state title last year and again this year. "I really wanted to go on to the nationals and win a week's vacation in Hawaii," she says, "but I made too many errors." She typed 120 words per minute for five minutes with seven errors. To be eligible to compete in the nationals, a typist cannot exceed the limit of five errors in five minutes or 3000 typing strokes. Myrleen says that she has better speed with the word processors, she's using at Sandia. She plans to enroll in Sandia's Out-of-Hours computer courses. "I want to learn programming," she says. Her husband is a computer technician for a company that has a service contract with the Labs. "Maybe someday I'll better



UNDER THE NEWEST photovoltaic equipment at Sandia, some distinguished visitors pause with their host. L to r, Senator Pete Domenici, DOE Secretary Donald Hodel, President Dacey, and DOE Assistant Secretary Herman Roser. The group also heard briefings on defense, pulsed power, and energy and visited the pulsed power facility and Coyote Canyon Test Complex.

understand what he's talking about when he tries to explain something about the computer he's building at home."

\* \* \*

The Singles Fellowship is sponsoring a Summer Sizzler Dance tomorrow night at 8 at the Church of the Risen Savior (7701 Wyoming NE). For tickets (at \$5 per person) or more info, call Frank Osterman on 6-7690.

\* \* \*

Homer McIlroy (3742) isn't afraid to get involved! Late in the afternoon of May 17 he was in his room at the Livermore Holiday Inn when he saw someone vandalizing an unattended city fire truck. As the person ran off, Homer summoned police. The suspect was apprehended a short time later, and Homer then cooperated with the police and made a positive identification of the subject.

\* \* \*

Another Sandian also got involved recently. Doug Hanson (8271) was called in to assist at Coalinga following the devastating earthquake that hit there May 2. Doug, an amateur radio operator, is a part of the Military Affiliated Radio Systems (MARS) in the Stockton area. The Red Cross called for communications aid, and Doug (along with others from this area) responded by setting up a mobile radio van at Westfall College in Coalinga. He stayed on the job for more than 24 hours until partial telephone service was restored to the area.

\* \* \*

Andy is a 13-year-old orangutan in the Rio Grande Zoo. To buy Andy a bride (and help procreate this endangered species), the New Mexico Zoological Society is sponsoring a "Saturday Night Live at the Zoo"

on June 18. Food, games, and entertainment are planned.

Admission to the event is \$3 for 13 years and older, \$2 for senior citizens, and \$1 for children 12 and under. Kids wearing animal masks are admitted free — the best masks in several categories will receive prizes.

A drawing (adults only) for a round-trip, three-day tour package to San Diego will also be held.

## Sandia Places Second In Corporate Cup

The 125-member Sandia team racked up some 550 points in the recent Corporate Cup competition, but finished second behind KAFB. LANL placed third. More than 1000 athletes competed.

The Sandia Masters Relay Team (age 40 and over) set a new record for the Corporate Cup — 20 minutes and seven seconds. Team members are Linda Graham (2626), Jim Shirber (1150), Dave Saylor (2424), and Henry Dodd (9752).

Shirber also took the 1500-metre master's race hands (or feet) down (he's a world class runner). Kathie Hiebert-Dodd (7241) won the women's mile race, and Dora Dunckel won the 100-metre dash. Ed Dale (2626) and Henry Dodd won the master's 10-kilometre road race. Tony Teague (3435) won both the 100- and 200-metre dashes. Becky Hunter (1540) was the top individual in the women's 5-kilometre road race. Sandia's A and B teams took first and second place.

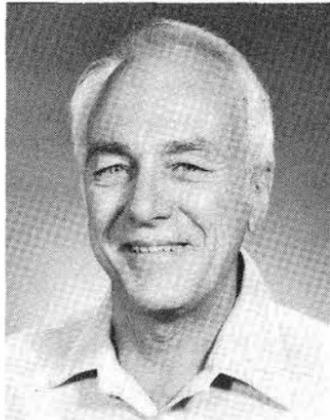
Francine Singleton (2515) was first in the women's high jump.

Sandia swept the shot put contest winning first, Marty Fuentes (9723); second, Bob Smyth (3613); and third, Richard Cernosek (7234).

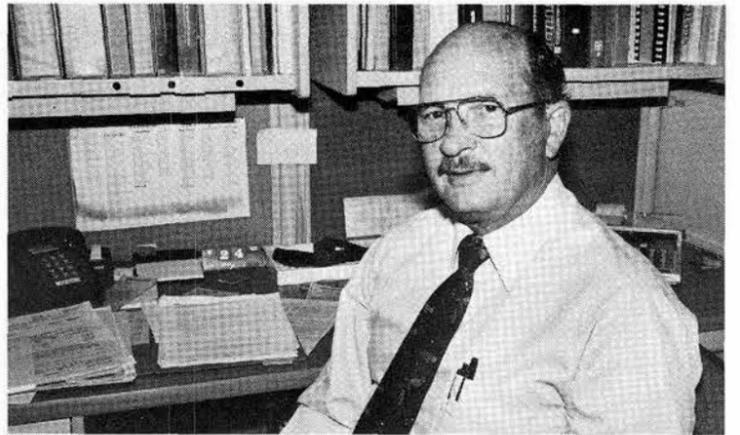
# MILEPOSTS

## LAB NEWS

JUNE 1983



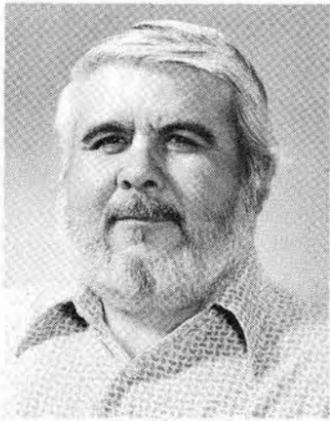
Dick Volk-7232 25



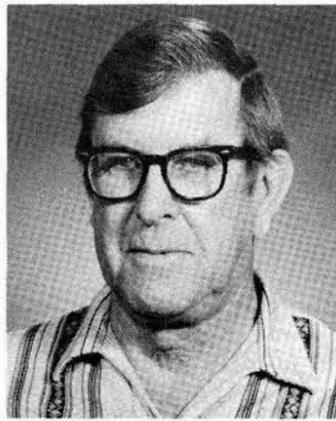
Frank Duggin-3711 35



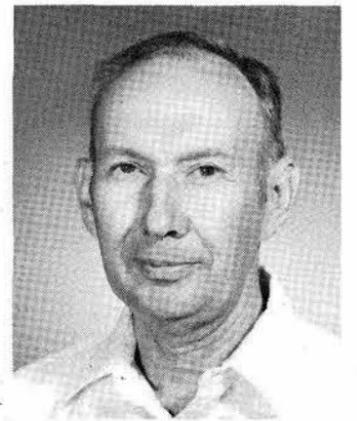
Dave Barton-132 20



Jose Salazar-7472 20



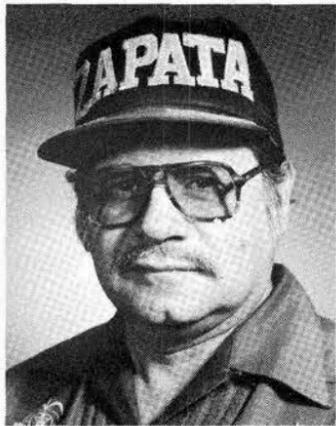
Coy Moss-2345 25



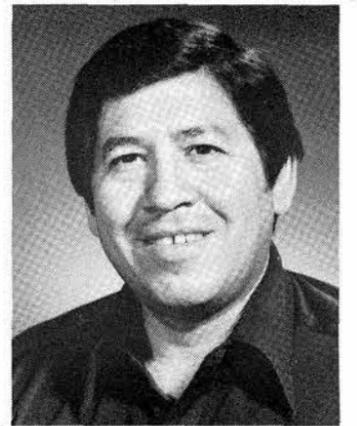
George Treadwell-9721 30



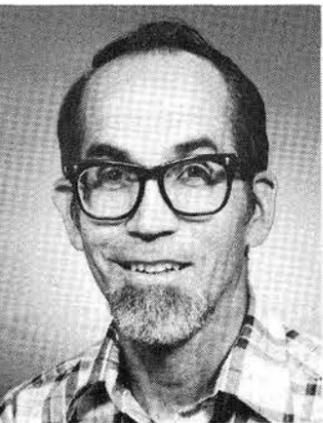
Jay Chamberlain-2525 20



Leo Armijo-3423 30



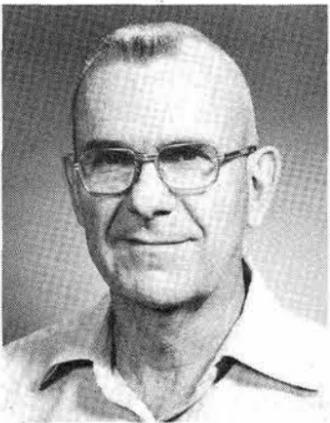
Henry Martinez-7482 15



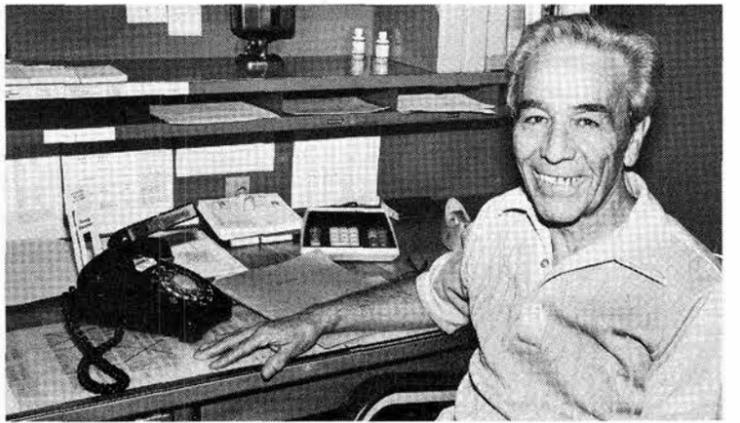
Bob Graham-1131 25



Marv Daniel-2113 20



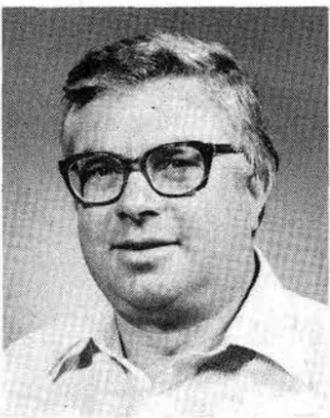
Al Hoge-2541 35



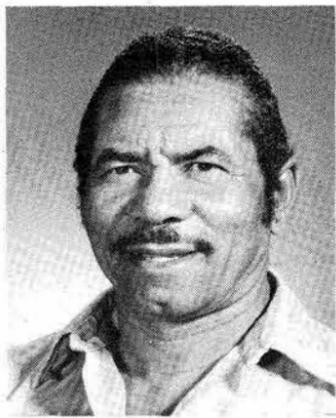
Frank Gurule-3741 35



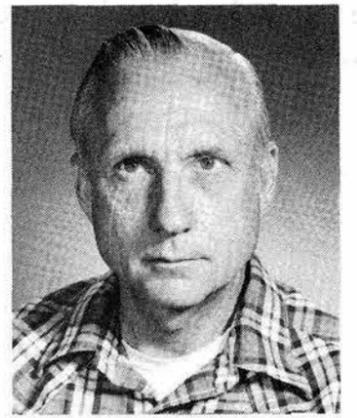
Don Fitchorn-2433 35



Duane DeWerff-9334 20



Jesse Waddles-3423 30



Ross Sinkey-2364 30



THE NEW EXHIBIT in the lobby of Bldg. 802 features the work of Jan Mansure, an Albuquerque artist who specializes in *batik*, a traditional art form practiced in Indonesia and other countries. Batik is a method of handprinting intricate patterns on textiles by coating with wax the parts not to be dyed. The technique was common throughout Europe over 200 years ago but was abandoned in favor of using rolling presses to print designs on textiles. Jan is married to Chip Mansure (9761).

UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS

CLASSIFIED ADVERTISING

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

RULES

1. Limit 20 words.
2. One ad per issue per category.
3. Submit in writing. No phone-ins.
4. Use home telephone numbers.
5. For active and retired Sandians and DOE employees.
6. No commercial ads, please.
7. No more than two insertions of same ad.
8. Include name and organization.
9. Housing listed here for sale is available for occupancy without regard to race, creed, color, or national origin.

MISCELLANEOUS

AM-FM Stereo, 8-track play-record system 2/turntable, \$68. Dieter, 255-8056.

GARDEN Mulch, wheat straw, \$2.50 per bale, will deliver to Sandia Labs parking lot. Shank, 877-4497.

VIDEO GAME, Odyssey 2 w/12 cartridges, \$250; 5 mos. of below average use. Reuben, 262-0713 after 5:30 p.m.

WHITE bathtub, toilet, and sink, \$50; 75 Chevy Truck back-bumper, \$50. Martinez, 296-2762.

OSCILLOSCOPE, Tektronix/Teleequipment, D67, 24 mhz, dual trace, delayed sweeps, probes, \$650. Ingram, 299-6194.

GARAGE SALE: June 7, 3441 Tahoe Street NE, (Holiday Park). Clothes, books, and decorative items etc. Purcell, 844-5658.

WINDOW A/C, Sears 8000 BTU/HR, \$80; shelf headboard for single bed, ash-blond, \$40; Pennys girls 10 speed, \$30. Haaker, 293-1077.

HOBIE CAT, 16 ft. Catamaran w/trailer, \$2,200. Potter, 831-0155 or 892-8812.

2 DOGS: Australian Shepherd, \$100; Llaso Apso, free, both 2½ yrs. old; wet suit, size 9 women's. Downs, 255-6524.

DOUBLE dresser w/mirror. Koski, 822-1122.

ROLL-AWAY bed, 4" foam mattress, 48 in. wide, includes plastic cover, \$70. Smith, 299-7157.

WASTE King Dishwasher, needs new motor. Folkins, 345-2801.

COLT Trooper .357 Mag, nickel finish, 8¼", barrel fired, with holster, \$275. Menschel, 892-6475.

RACK for carrying bicycle on car rear bumper, \$10. Hughes, 299-6674.

WATER TANKS, four passive solar thermal storage, 16 gal., painted flat black, 28"x10"x16", \$10 ea. Rainhart, 821-3690.

YARD SALE: antiques, furniture, toys, stove-toy with hood, clothes, etc. June 11, 9-4, Brookwood at Northland NE. Warpinski, 844-3640.

GAS STOVE, compact, apartment-sized, 20 in., 4 burner, white, Kenmore, \$75. Dalphin, 265-4029.

AIRCO cutting torch and hoses, \$100; 2.5 HP portable air-compressor, \$400; many used car parts. Brinkley, 344-5334.

SADDLE, water softener, props for Evinrude outboard, shopsmith-Mark V, chair, Sears car top carrier, ½ HP jet pump, 1/3 & 1/2 HP electric motor, Sears freezer, water skis, men's size 10½ and ride ski boots, 1 case Valvoline 10-40 oil. Schroeder, 344-1011.

DRUM set, Pearl, 3 piece w/7 cymbals, stands and throne, \$200. Abbott, 298-2039.

LAWN BOY, lawn mower, \$30; wire mesh, \$5; hot plate, \$4; assorted luggage, \$5 ea. Drayer, 821-4017.

GOLF SET: 1,3 woods, 3,5,7,9 P irons, bag & cart, \$45. Castillo, 242-9601.

PLAYER PIANO, needs restoration, \$500; Oak barrel game table, couch, chairs, 11 pcs, \$375; U-haul boxes, 50¢ ea. Roeske, 344-5659.

ATTIC ventilation fan, new w/thermostat, \$30; childrens' redwood table, \$30; coffee table, \$10; triple-dr. bath enclosure, \$15. Atkins, 298-5762.

AKC registered, female Norwegian Elkhound puppy, dam and sire pointed, champion bloodlines, for show or pet, \$225. Loeber, 821-3674.

ROOF top luggage carrier, water proof fabric top w/masonite bottom, w/all mounting hardware, \$25. Hannum, 296-2095.

DOUBLE sink w/countertop, \$15; Clymer Honda twin manual, \$5; free Honda CB360T parts. Zirzow, 294-6142.

ENCYCLOPEDIA Britannica, 15th edition, 30 vols., 1977, red vinyl binding, \$500. Hulme, 299-7715.

2 DOGS, Great Dane females, fawn, brindle, 2 yrs. old, need loving home. Leonard, 865-5338.

12 FT. alum. car top boat, Sea King, \$325. Martin, 869-2049.

CARPET, 13'x16', Copper haze, courtyard brick pattern, \$50; carpet, 11'x14', gold, \$25. Trump, 299-5162.

STOVE, Corning ceramic cooktop, Minute-Maid brand w/vented hood, in good working order, \$300. Sherman, 292-3297.

HANDVAC Eureka model 150-AT w/shoulder strap and all attachments, \$15. Rainhart, 821-3690.

KENMORE portable washer, 3-cycle, 18 mos. old, \$250. Beeson, 294-8791.

14' HOBIE catamaran, tequila sunrise sail, jackets, trailer, \$1800. McLaughlin, 881-0875.

FISH TANK 36"x12"x15" complete w/FL strip lamp, gravel, heater,

aerator, gravel. \$85. Vinson, 255-6962, 836 Arizona SE.

HP-34C calculator, charger and manuals, has key for "solve" and "integration" functions, new HP battery pack installed, \$54. Lewis, 883-8454.

EXERCYCLE, Sears, \$75; dirt bike VDO speedometer, \$50; Coors beer tap CO<sub>2</sub> gauge, complete \$75. Lassiter, 299-1492.

WINDMILL, 1-10 ft, \$6000; needs few repairs, lawn mower, \$50. 2803 Manzano NE, 87110. Romero, 888-3890.

BLACK Labrador Puppies, champion blood line, AKC registered, 2 mos. old. Duggin, 268-8507.

SWIVEL chair, \$10; typewriter stand, \$7; bike rack, \$4; LAPD cycle helmet, \$7; Wilson racket w/gut, \$10. Shunny, 265-1620.

FRAMED peg boards, 4'x5', \$400; 12"x14"x16" and 18"57" shelving, \$1.50 ea. Houghton, 299-3386.

CINDER block paving stones, 8x16x2, \$80. Gleicher, 294-8777.

PUPPIES, cocker spaniels, black, 8 wks. old, AKC registered, vaccinated, \$75 ea. Biefeld, 292-1671.

BMX bike has all racing accessories, \$125; Silvertone Electric solid body guitar w/amplifier, \$125. Arana, 299-1214.

DURST #606 Enlarger for 35mm, and 2¼ sq. developing tanks, trays, lights, and timers. Complete darkroom outfit, \$185. Ludwick, 296-6447.

MOVING boxes, wardrobe, large/small dish packs, \$10. Hendrick, 296-2163.

GARAGE SALE: 2 family tables, chairs, 19" TV, many household items, June 11, 9 am to 6 pm & June 12, 1 to 5pm. 3024 San Pablo NE. Sublett, 884-4426.

MOTORCYCLE helmet, Arthur Fulmer, like new, \$50. Gurule, 292-4736.

MATTRESS, king-size, \$25 or make offer. Jones, 255-7924.

TRANSPORTATION

'81 SUZUKI GS1000 shaft drive including fairing, saddle bags and 2 helmets, 8,790 miles, \$2800. Gallegos, 821-2487.

'81 HONDA XL 185S, 2900 miles, rack and trunk included, \$750. Opland, 298-3252.

MOTORCYCLE, 77 YZ Yamaha dirt bike, \$700. Wright, 296-3850.

'80 MOTO GUZZI, 1000 SP, 7000 miles, new battery, new rear tire, new imron paint, \$3300. Weatherbee, 869-2849.

'73 MAVERICK, AT, 4-DR, 6 cyl, Michelin tires, 63K miles. Villa, 298-0435.

'76 FIAT 131 SW, 5SP AC, \$1600. Barton, 268-7349 after 5.

'81 PONTIAC LeMans, V6, AC, AT, PS, PB, \$4975. McBride, 299-4347.

'82 JAYCO, 8' Cabover truck camper, pop-up model, low drag profile, refrig, jacks, other items, \$3800. Connell, 292-7264.

'76 MOTO GUZZI LeMans, many performance options, 11,000 miles; '82 Yamaha TT250, 300 miles. Baca, 299-2036.

'71 TRAVEL TRAILER, 21 ft. self-contained including shower and hot-water heater. Beaudet, 299-0849 after 5.

'78 HONDA CX500, fully equipped, reliable, garage kept, maintenance records, \$1500. Bagley, 821-8247 evenings.

'77 PLYMOUTH Volare wagon, AT, PS, PB, V8, good tires, 65K miles, \$1500. Kolb, 294-5860.

KAWASAKI KZ-1000, Mark II, 4600 miles, new, garage stored. Brewer, 821-2508.

'77 OLDSMOBILE Starfire, '78 Ford Valiant SW, '72 Blazer (2 wheel drive). O'Neill, 892-6754.

TRIMARAN, Searunner (brown) 25, fully equipped, folds for trailering. Consider camper motor home trades. York, 1-538-9092.

'82 FORD Escort, 4 cyl., 4 spd., 2800 miles, \$4000, cash; '78 Ford LTD, 4-DR, \$2000. Brinkley, 344-5334.

'74 AMC Hornet stn. wgn., V-8 loaded, new tires, 75,000 miles, \$1100. Ross, 296-9794.

'78 HONDA Twinstar CM185T, 10K miles, good cycle for school student or wife. Consider trade 400-550cc, \$725. Rozelle, 298-0396.

'78 FORD F-100 PU, 4-spd, overdrive, 41K miles, AM-FM 8-track, one owner, Palmer, 296-2551 after 5.

'68 3/4 ton Chevrolet van. Zirow, 294-6142.

'79 HONDA CX500, custom, crash bars, luggage rack, cover, and shop manual, shaft drive, water cooled, \$1800. Hannum, 296-2095.

BMX BIKE, Mongoose. Ferguson, 266-4769.

'79 YAMAHA, driveshaft XS 750 SF, 2-matching helmets, less than 12,000 miles, \$1900 or best offer. Jinzo, 897-2349.

'74 TOYOTA Corolla 1200, 4-cylinder, 4 spd-stick, low mileage-66,000 actual, \$1195. Meyer, 296-9066.

'77 SCIROCCO, 57,000 miles, AC stereo tape deck, recent radials, \$3400. Stump, 344-9340.

RACING Bike, Bianchi 24" frame, campagnolo equipment, matching pump and water bottle, celeste green, \$425; bike, 20" Schwinn Stingray, \$45. Mayer, 294-3368.

REAL ESTATE

WOODED ACREAGE, 5 acres, 12 mi. So. on NM14. Electricity, proven water. Nice homes in vicinity, \$25,000. Meikle, 299-4640.

SPACIOUS 6 bedroom brick, Sandia High, den w/fireplace, 3 baths, B/I appliances, DW, carpeting, 2½ car garage. No qualifying, 9.5%. Browne, 884-1343 or 881-3772.

'77 SCHULTZ mobile home, 2 bdr., all maintained and cleaned. Ready to move to your lot. Runkle, 877-2008.

5½ ACRES in Jemez Mtns., electricity, pure spring water, natural gas, Nat'l. Forest surrounding, Ponderosa pine & meadow, \$48,500. Hughes, 299-6674.

MOBILE HOME, 1979 Nashua, 14x70, 2 bdr., 2-bath, large livingroom and kitchen. Assumable loan. Jones, 281-1186.

UNIQUE NE custom home, 5-bdr., 3 bath, study solar, dbl. garage, upstairs, master suite w/deck, \$94,700. Flexible terms. Riggan, 268-1961.

THREE BEDROOM HOME, 1420 sq. ft., 1½ baths, fireplace, custom built-in bar. Princess Jeanne area, \$66,000. Graham, 293-7302.

10 ACRES, S-217 appraised \$40,000 selling for \$35,000 cash. Will consider drilling well, power nearby. Hands, 836-5919.

4 BDR, 1½ bath, garage, large yard, access and 8' fence (Chelwood and Copper). Available July 1, \$475/mo, \$200 DD. Long, 296-2590.

WANTED

HOME for 2 medium-sized dogs, 8 yrs. old, male, neutered, all current shots and tags. Binder, 299-2937.

GO-CART, any condition. Wrobel, 293-0283.

HOUSE to rent by August 1, 2-3 bdr., w/garage-unfurnished, have own appliances. Prefer Northeast area. Greer, 836-1411.

SERVICE manual for 1970 Chevelle. Moyer, 881-3879.

ROTARY electric mower. Baxter, 344-7601.

OCCUPANT for 3 bdr. house, start approx. July 5 for 3 to 6 months, non-smoker, pay utilities and maintenance. Glaser, 293-8110.

TRAVEL TRAILER, 18' to 29', self-contained, tandem axle, 1976 to 1980 model preferred. Ludwick, 296-6447.

'77 VEGA that smokes and has rust, dirt bike that runs. Greer, 836-1411.

MACHINE DESIGN magazine, 19 May 1983 issue, 1983 Electrical and Electronic reference issue. Hicker-son, 892-6699.

WORK WANTED

LAWN JOBS, light hauling, rototilling. Witenhoeger, 298-2510.

RENT-A-NANNY, full or part-time babysitting, high school junior, experienced. Switendick, 255-1003.

SHARE-A-RIDE

CARPOOLER or fellow bicyclist to commute from Sandia Labs to UNM and return for daily, 10:30-Noon summer class. Murray, 255-3421.

## Coronado Club Activities

# Work Nightshift Tonight

TONIGHT, a group called Nightshift holds the bandstand playing a danceable soft rock with all the new tunes. The Club's new standard menu — featuring fine steaks, sea food, and chicken — is in effect. Tonight's special is fish and chips at \$5.95. Happy Hour prices run from 4:30 until 8:30 when the music starts. Next Friday, June 17, a country and western band named Westwind makes the music while the special is filet mignon at \$7.25. Free western dance lessons by Karen Edwards are offered from 7 to 8 p.m.

TUESDAY TWO-FOR-ONE dining continues this month with New England stuffed flounder offered at \$9.95 for two next Tuesday, June 14. Entertaining that evening is the Arlen Asher Trio — perhaps the finest musicians in the city. They play a cool jazz in a cerebral mode. On Tuesday, June 21, Alex Montoya returns to play your requests on the piano. The special is stuffed pork chops for two for \$7.95. In addition, the Club's standard menu is available. Call 265-6791 for reservations. Dining hours are 6 to 8:30 p.m.

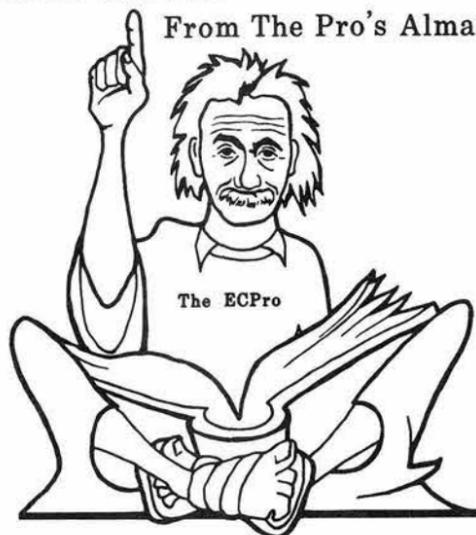
GAMES NIGHT every Thursday continues to generate enthusiasm as the crowd carts off prizes. The early bird game is called at 6:45, regular play starts at 7. Super sandwiches are available at 5:30. Mondays through Fridays, there's a single game in the main lounge at 6.

LUNCH at the Coronado Club is one of the more pleasant parts of the working day. The menu features (always) roast round of beef sandwiches, ham, turkey, cheeses, and a daily special. There's soup and green chili and two sizes of salad. There's always room for a private party — call 265-6791.

THE CORONADO CLUB SWIM TEAM for youngsters 18 and under is organized and working out each morning Monday

### Fiction And Fact

From The Pro's Almanac



Dear ECP Pro: I've heard about Donor Option. I'd like to take it. I need a donation badly. Empty Pockets

Dear Pockets: Truly, an empty wallet is like an uncluttered house: there is room to stretch. Donor Option means 'your choice to give... give to your choice.' Isn't such freedom frightening?

(If you have an ECP question, sign it and send it to the ECP Pro, 3151.)



THREE EXPERT TEACHERS practice their skills on Ann Griego (3511). She's the coordinator for Sandia's Summer Science Program, and they — l to r, Lea Beth Willener, Jon Black, and Vincent Turietta — are the high school teachers who serve as consultants to the Sandians who will instruct the promising high school students selected for the program at Valley, Eldorado, and Bernalillo High Schools, respectively. The program, now in its tenth year, gives students a chance to work with professionals in science and engineering and thus become encouraged to pursue similar careers.

through Friday at 7:45 in the Club's twin pools. Additional members are needed. If you have a youngster interested in competitive swimming, call Tom Lenz (recreation manager) at 4-8486.

THE BIG ONE on the June calendar is the Club's annual Luau scheduled this year on June 25. There are goodies galore on the Hawaiian menu planned — roast pig, mahi mahi, Maui sweet and sour chicken, oriental vegetables, and more. Freddie Baker's Polynesian Review will perform with grass-skirted dancers and the spectacular fire dance. Weather permitting, it's scheduled for the pool and patio area, but make your reservations early. This is one of the biggest parties of the year.

## Sperry Sponsoring 'Run for United Way'

A four-mile run (or a two-mile walk, if you'd rather) on Saturday, June 25, sponsored by Sperry Flight Systems will mean another \$5 to the United Way of Albuquerque for each participant. All participants will receive T-shirts, and only participants will be eligible for a drawing — the grand prize is a round trip to any place in the world for two. Other prizes in the drawing include expense-paid weekends for two in local hotels.

There will be 16 categories in the race for males and females in all age groups. Winners will receive ribbons.

Entry fee is \$5 which covers race expenses. The \$5 donation that Sperry makes to United Way for each entrant is in addition to the company's usual gift to United Way.

The event starts at 8 a.m. at the Sperry parking lot, 9201 San Mateo NE. LAB NEWS has entry forms and more information on the races.

## Events Calendar

June 10-12, 17-19, 24-26 — "Student Prince," 8:15 p.m., Sun. matinee, 2:15 p.m.; Albuquerque Civic Light Opera Assoc., Popejoy.

June 11 — June Jamboree, Pop Concert, NM Symphony Orchestra and the Watermelon Mountain Jug Band, box dinner and beverage available, 8:15 p.m., First Plaza.

June 11 — Annual Fiesta de la Primavera, fundraiser for the Turquoise Trail Volunteer Fire Dept.; arts, crafts, food booths, noon-6 p.m., Cerrillos.

June 11 — Barbershop Benefit for Carrie Tingley Children's Hospital, featuring the Enchanted Mesa Sweet Adelines and The New Mexichords, 7 & 9 p.m., Kimo Theater, 883-7191.

June 11-12 — Our Lady of Guadalupe Parish Fiesta, noon to 7, 345-4596.

June 12 — The Chaco Phenomenon, a major exhibition about the Southwestern culture that was centered at Chaco Canyon. Maxwell Museum of Anthropology, UNM.

June 12-Sept. 16 — "The Red and the Black," Santa Clara pottery by Margaret Tafoya, Wheelwright Museum, Santa Fe.

June 22 — "Cinema New Mexico" at Albuquerque Museum: *The Golden Fish* and *The Incredible Cat Tale* at 3 p.m.; *Indian Day School* (1898) and *Pueblo Legend, The Tourists*, and *The Old Actor*, three Mary Pickford movies ca. 1912. Free admission.

June 24-26 — 32nd Annual Arts & Crafts Fair, State Fairgrounds, 884-9043.

Through June 26 — "The Effect of Gamma Rays on Man-in-the-Moon Marigolds," The Vortex Theatre, Fri. & Sat., 8 p.m.; Sun., 2:30 p.m., 247-8600.