

SEMATECH Taps Sandia for Help in Restoring US Chip Supremacy

For more than a decade, US semiconductor companies — once the unchallenged leaders in the world chip market — have been falling behind their foreign competitors.

Now, Sandia will play an expanded role in helping restore US competitiveness in this market through a joint venture with SEMATECH — the Austin, Tex.-based consortium of integrated circuit (IC) manufacturers who joined forces in 1987 to develop advanced IC manufacturing technology.

The technical assistance agreement between SEMATECH and Sandia calls for the Labs to develop a national IC processing equipment center

“One of SEMATECH’s goals is to produce equipment that can run for 5000 hours between failures.”

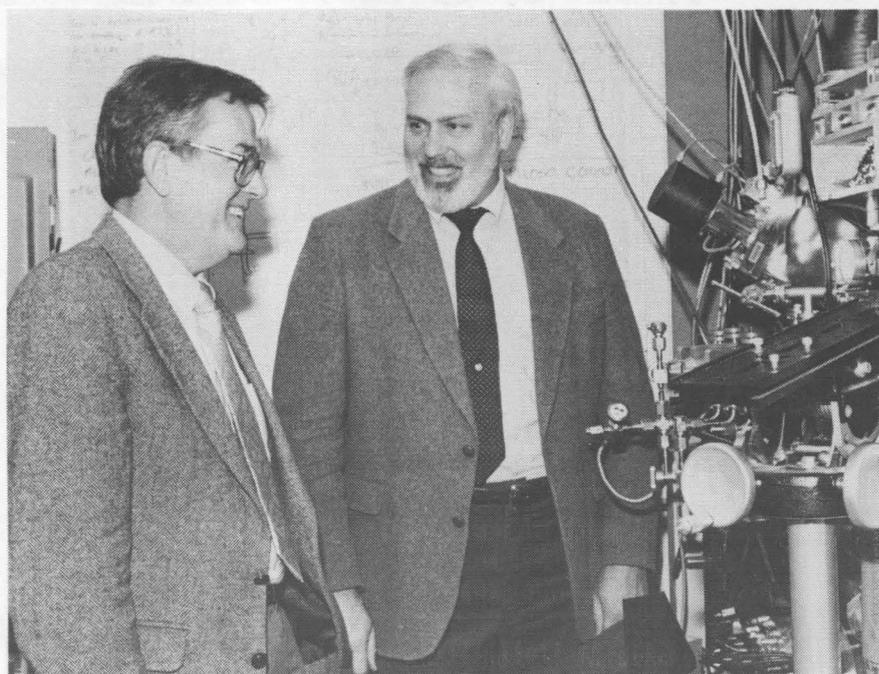
here. Called SETEC, or Semiconductor Equipment Technology Center, its mission is to help companies that manufacture IC-processing equipment improve the reliability of existing equipment and develop advanced equipment and processing techniques that will help the US compete effectively in the international semiconductor market.

The agreement is being signed and announced here today during a colloquium involving SEMATECH officials, members of the New Mexico Congressional delegation, State govern-

Using All the National Resources

SEMATECH President Bob Noyce says SETEC will be the consortium’s first experience of working with a national lab, but he anticipates additional cooperative work: “We want to use all the national resources that we can to solve the very serious problems of America’s declining competitiveness.”

Noyce is a pioneer in the electronics industry and a co-founder of two IC companies — Fairchild Semiconductor and Intel Corp. (See “Noyce on State of the Semiconductor Industry,” page five.)



SETEC’S WORK of helping US semiconductor equipment manufacturers improve the reliability of chip-making equipment and processes will involve many organizations throughout the Labs, says Wayne Johnson (1126, right), who teamed with Jim Gerardo (1120) to work with SEMATECH officials on coordinating development of the center at Sandia.

ment officials, SRC (Semiconductor Research Corporation) officials, and a number of Sandia, DOE, and DARPA (DoD’s Defense Advanced Research Projects Agency) representatives.

SEMATECH President and CEO Robert (Bob) Noyce, Senator Pete Domenici, Representative Steve Schiff, and Governor Garrey Carruthers are among the visiting officials who are scheduled to participate in the meeting that begins this morning in the Technology Transfer Center.

Tuning Up Tools of the Trade

“One of the greatest weaknesses in the US semiconductor industry today is the repeatability and reliability of semiconductor manufacturing

equipment — the tools of the trade,” says Bob Noyce.

Market researchers estimate that US chip production lines can be used only 25 to 40 percent of a given workweek because they are so often shut down for repair or maintenance of machines. The mean time between failures for equipment on a semiconductor manufacturing line is estimated to be about 10 to 200 hours.

“One of SEMATECH’s goals,” says Noyce, “is to produce equipment that can run for 5000 hours between failures.”

Through SETEC, Sandia will work to help SEMATECH achieve that goal by developing techniques to collect and analyze data on mean-

(Continued on Page Four)

LAB NEWS

VOL. 41, NO. 17 SANDIA NATIONAL LABORATORIES AUGUST 25, 1989

For IAEA Inspectors

Training Course Goal: Transfer of Safeguards Technology

Back in the '50s, worldwide concern about limiting the spread of nuclear weapons led to the establishment of the International Atomic Energy Agency (IAEA). A main objective of the Agency, headquartered in Vienna, is to ensure

“The devices operate unattended for long periods of time . . . and must be reliable and tamper-resistant, because C/S data are fundamental to the inspectors’ reports to IAEA.”

that nuclear material used for peaceful purposes is not diverted in any of IAEA’s 113 member states.

Providing that assurance means that IAEA must verify — in an independent and technically correct manner — that member states are complying with their IAEA safeguards agreements.

That’s where Sandia enters the picture. Members of Nuclear Security Systems Directorate

5200, through their international safeguards efforts, are helping the IAEA to ensure that nuclear material worldwide is being used for stated purposes.

Part of those efforts involve training for the Agency. For example, 12 IAEA inspectors from eight countries were in Albuquerque July 31-Aug. 1 to attend a training course on Containment and Surveillance (C/S) technology conducted by 5200.

The two-day training course, held at a local hotel, was the seventh conducted by Sandia since the program began in April 1986. Approximately 75 people were trained in the six previous courses. Inspectors at the most recent session represented Bolivia, Canada, Japan, Morocco, Poland, UK, US, and Zaire.

IAEA inspectors, as the name implies, make

(Continued on Page Six)



LEE SCHOENEMAN (5217), second from left, explains a PC-Based Ultrasonic Seal Pattern Reader to Don Amundrud of Canada (right) and Lawrence Beaman of the US. Rob Tooley (5217, left) looks on. The PC-SPAR, developed at Sandia, will be used to analyze the integrity of ultrasonic seals at nuclear facilities in IAEA member countries.

Quality: the Key Word in Major New INTEC Curricula — See Page Ten

This & That

This Isn't Our Soviet Union Travel Issue — but you might think so. Donna Rix's story about the trip that Jack Jackson (9241) and Art DuCharme (6513) took to Leningrad last December has been ready for several weeks, but was postponed several times for lack of space. After we scheduled it for this issue, we received copy for the Sandia, Livermore, page from Barry Schrader (8522). Surprise! Barry's feature is an "unusual vacation" story about Jim Alvarez's (8453) recent trip to Moscow. Great timing, huh? It'll probably be a hot day in Siberia before we have another unusual vacation story about a trip to the Soviet Union.

* * *

More Variations — of the Sandia name and address continue to turn up on correspondence. Among the recent ones: Snadia National Labs in Aubra Verques (to Chris Olson, 9127), Samdoa Matl Laborato (to Wilson Brooks, 9141), Sandy & National Labs (to Barbara Hawkins, 3211), and Santa Laboratories (to Gary Froehlich, 2344). I think that last one is staffed by elves. Probably the most common misspelling: Saudia National Labs. Several Sandians have sent that one to us.

* * *

How Not to Keep a Secret — From the July/August issue of the *Bulletin of the American Physical Society*: A reporter called the Washington office of White House Chief of Staff John Sununu to check out a rumor of an upcoming meeting between Sununu and University of Utah researcher B. Stanley Pons, co-inventor of the controversial "cold fusion" process. The caller asked, "Is Governor Sununu to meet with Professor Pons?" "I cannot confirm that," came the reply, "since the meeting is private." Thanks, Marvin Moss (4051).

* * *

Love Those Names — Most folks in the "word business" appreciate creative names and titles. Two caught my eye in the past month. One is a company name that was mentioned in our July 28 issue. Schott Glass Technologies manufactures S-glass, invented by Howard McCollister (DMTS) and Scott Reed (both 7476). The other is the title of a recent talk by Raymond Guilmette of the Inhalation Toxicology Research Institute: "Nasal Airways: The Rodney Dangerfield of the Respiratory Tract."

* * *

Show Time in Albuquerque — Here's a recommendation: the new Dynamax Theater that opened early this month in the New Mexico Museum of Natural History. It features 70mm films projected onto a 27- by 40-foot screen; a six-channel, 400-watts-per-channel stereo system; and up-close seating that "creates an image so realistic it projects the viewer into the on-screen action." After viewing the current attraction, "Flyers," I agree. Among other things, you experience how it feels to wing-walk on a plane over the Grand Canyon and fly in an F-15 jet fighter. This attraction plays for about five more months. Showings are every hour, 10 a.m. through 5 p.m. Admission revenues support Museum operations. Ticket information is available on 841-8837.

* * *

Wasting Away — Jim Gearhart (5126) couldn't help noticing the irony several weeks ago when he saw a commercial truck driver enter the Kiva Cafeteria, order breakfast, and sit down for a leisurely meal. The driver left his engine running all the while. The truck was from a waste management firm. ●LP



AT&T COLORS OVERHEAD — The AT&T flag now flies below "Old Glory" at all Sandia facilities. Lt. Greg Seymour (3434) is seen here raising the flags over Bldg. 800. The AT&T flags are flying at the suggestion of Sandia President Al Narath, who says it's just one more way of maintaining close ties with our AT&T parent company and expressing pride in the relationship. AT&T has managed Sandia since November 1, 1949.

Feet Around America

TLC Declares September Walking Month

Sandians are invited to join TLC's (Total Life Concept) "Feet Around America" program again this year. Trek from El Paso along the perimeter of the United States — 11,204 miles — without leaving the state (or even your own neighborhood).

Participants will keep a weekly log of miles walked that will be combined with the miles of other participants and then plotted on a map of the continental US. Cumulative progress will be plotted on a map posted in the Sandia Medical Clinic.

Participants are invited to a two-part lecture series on fitness walking. The lectures will be in the Technology Transfer Center Sept. 5 and 19, 12 to 12:45 p.m. Free wrist wallets will be given to the first 150 folks who show up at the Sept. 5 lecture.

Contact Michaeli Portman (3330) on 4-1574 for registration forms and fitness packets.

Congratulations

To Caroline and Steve (2515) Schlobohm, a son, Garrett, June 25.

To Debbie Woods and Randy Harrison (2811), married in Albuquerque, July 29.

To Halley and Mark (1153) Anderson, a daughter, Kristin Rene, Aug. 6.

To Nida Gosselin (7533) and Charles O'Connor, married in Albuquerque, Aug. 10.

Sympathy

To Jerry Wymer (7525) on the death of his father in Kansas, July 21.

To Charlotte Hunt (6345) on the death of her sister in Albuquerque, Aug. 3.

To Edward Kociscin (2857) on the death of his mother in Lansford, Pa., Aug. 4.

To Gary Mauth (9220) on the death of his mother in Idaho Falls, Idaho, Aug. 4.

To Roberto Mata (7525) on the death of his grandfather in El Paso, Aug. 6.

Take Note

Sandia Colloquia

Bernard Cohen (University of Pittsburgh Physics Dept.) will discuss "Radon in American Homes" Sept. 1 at 9 a.m. in Bldg. 815 (not as usual in the TTC). Call host Nestor Ortiz (3200) on 4-7221 for information.

Ronald Moen (Associates in Process Development) will present "An Overview of the Deming Philosophy" Sept. 15 in the Technology Transfer Center, 9 a.m. Contact host Roger Hagengruber (9000) on 4-7310 for information.

"How To Talk So Kids Will Listen and How To Listen So Kids Will Talk" will be presented at a one-day workshop by Family and Children's Services, Inc. (a United Way agency) Sept. 23 at the Albuquerque Little Theatre, 8:30 a.m.-3:30 p.m. Topics include new ideas on discipline, bringing out the best in children, dealing with behavior problems, and enjoying a relationship with children. Call 243-2551 for information.

LAB NEWS

Published Fortnightly on Fridays

SANDIA NATIONAL LABORATORIES

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LIVERMORE, CALIFORNIA 94550
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Sandia National Laboratories is operated by Sandia Corporation, a subsidiary of AT&T Technologies, Inc., and a prime contractor to the US Department of Energy.

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Unusual Vacation — Aikido in Moscow

Sandian Gives Martial-Arts Lessons to Soviets, Gets a Taste of Russian Hospitality

Not many Americans travel to the Soviet Union to teach Russian citizens a Japanese martial art. But Jim Alvarez, of Electronic Sensor Div. 8453, did just that earlier this summer.

Jim spent June 30 to July 8 in Moscow as one of 31 American instructors working with Soviet students of Aikido. It was the second such visit, 18 months after the first (which was organized by Aikido Sensei [teacher] Koichi Barrish of Everett, Wash.).

Jim began studying martial arts 16 years ago — starting with Chinese Kung Fu for five years. He then began practicing Aikido and has attained the rank of Second Degree Black Belt.

According to Jim, Aikido was introduced into the USSR a few years ago by a Japanese exchange student at the University of Moscow. It's now officially sanctioned by Soviet authorities, although some other martial art forms are not yet allowed.

The group — including people from Washington, Colorado, Montana, and California — were assigned hosts in Moscow. Jim stayed at the home of the group's interpreters, a husband-and-wife team. "Preconceived notions of the Soviet Union and its people break down fast when you stay with them and get to know them person-to-person," says Jim.

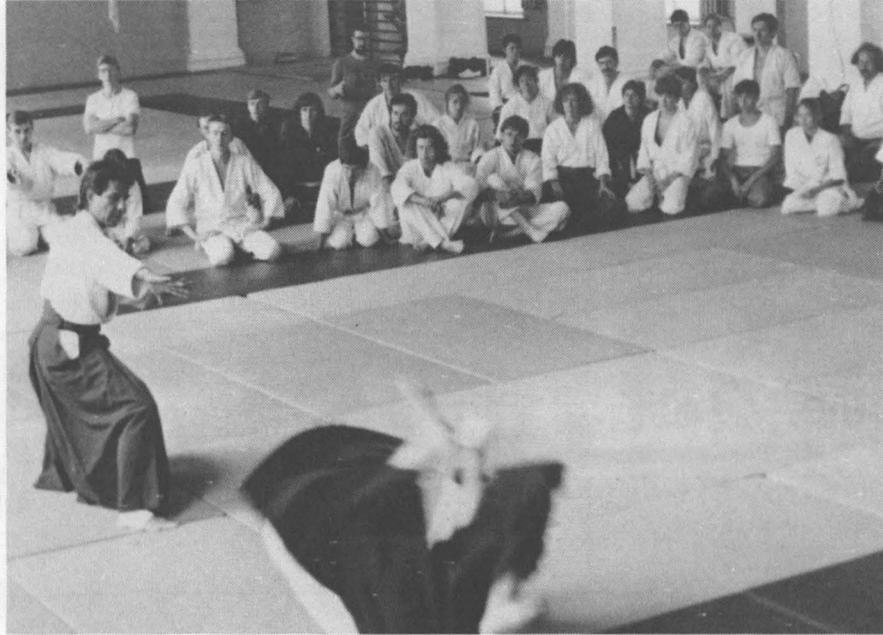
Even Jokes Survived Translation

Jim's hosts were experts in English. The woman is an English teacher in Russia. The man, a former interpreter for the Soviets at the United Nations in New York, now translates English-language documents into Russian for the government.

"They could listen to a long dissertation from our Sensei Barrish and repeat it all in Russian word for word," says Jim. "Even the jokes were translated. You could tell by the expressions on the faces of the Russian Aikido enthusiasts that they understood perfectly."

The Americans worked out for three to four hours each day with Russian students and instructors. The gymnasium-like great hall (Dojo) normally attracted about 100 people for each of two classes per day. When word of the Americans' arrival spread, however, up to 200 students at a time worked out on the mats.

"We had maybe 50 additional people around the edges as spectators at first," adds Jim, "but later in the week they moved out onto the mats to



JIM ALVAREZ (8453) demonstrates his Aikido techniques before Russian students and instructors on a recent trip to Moscow. He wears the traditional Keiko Gi and also a Hakama — large divided pants like those the Samurai wore during Japanese feudal times. The Hakama is worn only by those of Black Belt rank.

learn this unfamiliar martial arts form."

There was a little time to be tourists as well, Jim says: "On the 4th of July, a rare day off, we visited Red Square and nearby sights. One of the most beautiful attractions was St. Basil's Cathedral — like something out of Disneyland with its colorful towers, spires, and domes. It contrasted with the drab walls of the Kremlin and Lenin's mausoleum."

They also spent a day in the countryside along the Moscow River, near a huge state-run farm. "We went for a walk through the farm-workers' village," says Jim. "It was a quaint-looking place that had ancient log houses. Some of the homes were resurfaced on the outside with plaster, which made them look newer. I had brought along lots of gum and handed it out to the curious children who gathered around our group — I almost felt like the Pied Piper!"

Whack From a Babushka

Jim was impressed by the metro stations and the subways: "The art-deco-looking buildings had huge columns and lots of scrollwork. You showed your pass inside these stations and then were whisked down a very long underground escalator. The subways were neat and clean, with ornate murals, big statues of figures in Russian history, and even huge chandeliers.

"People really care about the condition of these facilities. I was sitting on a bench waiting for the metro and had one foot up on the bench, when a "babushka" [elderly woman] came by and slapped my leg, not knowing or caring that I was a foreigner. You just don't do that to their nicely kept seating."

Jim says they had plenty of food, but the restaurants left something to be desired: "We ate well, but there wasn't much variety. Fresh vegetables were in season, so we were given lots of

cucumbers — more than I had ever eaten before — and tomatoes and cauliflower. They also served a lot of sausage, cold. We tried to order chicken whenever we could.

"It was difficult to find eating places, as there are no yellow pages to look up restaurant listings and no advertising for restaurants. The best eating place was a citizen-run co-op, which had a four-page menu, salads, soup, and real ice water — something rare in the average Russian diner."

Through the hospitality of his host, Jim sampled fresh-brewed Russian beer. "He was a connoisseur and shared his hard-to-get beer. Russian beers are like a pale pilsner — and pretty tasty, since they don't have preservatives. The caps are dated, and you drink the beer in five days, or it spoils. There are no labels on the bottles — you return them to the store for a refund when empty." He found out that he was the only one of the visiting American group to get a taste of Russian beer.

Maybe a Return Trip

Jim says he's still excited about his experience and warmed by new friendships with fellow Aikido enthusiasts. He wants to return to Russia on another trip in a year or so, when the next one is organized.

Five or six Soviet Aikidoists may be able to come to the Bay Area next year, says Jim. He hopes to host them for training with his students at his Dojo at Amador Studios in Livermore, where he teaches evening Aikido classes. ●BLS

 SANDIA
LIVERMORE NEWS

Meeting Aggression with Calm

Jim Alvarez (8453) explains that Aikido is more than a physical martial art or a technique to defeat an enemy. The name literally means the way (Do) to harmony (Ai) with the life force of the universe (Ki).

He says Aikido has its origins in the centuries-old traditions of the Japanese martial arts. It is a form of "budo," the martial ways of self-refinement and character development. Aikido aims to replace the natural reaction of offense with defense, protection rather than counter-destruction. It uses avoidance, control, and neutralization — characterized by a relaxed body, calm mind, integrated breath, and extension of natural energies.

The technique involves moving circularly out of the line of attack and using the opponent's momentum to overcome him or her. There is no contest of brute force, no blocking, kicking, or striking techniques. Aikido aims to remove the idea of aggression from the antagonist's mind by yielding to his force in such a way that he hurts only himself with his aggressiveness.

Take Note

Barry Schrader (8522) was recently honored by the Livermore-Amador Valley Exchange Club as recipient of its annual "Book of Golden Deeds" award. He was recognized for his efforts in getting the Valley Campus of Chabot College elevated to a separate full-fledged college, recently renamed Las Positas College.

Sympathy

To Donna Mitchell (8237) on the death of her grandmother in Benicia, June 17.

To Dick Demo (8445) on the death of his wife in Los Angeles, June 21.

To Suzanne Follett (8275) on the death of her father in Fremont, July 23.

Fun & Games

Ben Odegard (8312) accomplished every golfer's dream — a hole-in-one — not for the first time, but the second in four years. Two of the Sandians who were with him at the time of his first ace — Anton West (8446) and Dale Boehme (8313) — were there again on July 16 at the Lake Chabot course.

Ben hit his first hole-in-one at the Tilden Park golf course. This time it was the 170-yard, par 3 second hole of the Lake Chabot course. He says the only part of the green in sight is the top of the flag, so they didn't know the ball had gone into the cup until they got to the green and began to look for it. The Sandia Employees Golf Club presented him an award for the rare achievement.

(Continued from Page One)

SEMATECH Taps Sandia

time-between-failures rates, analyzing the specific components that cause breakdowns, and supporting an equipment improvement plan to extend the life of those components. The Labs will also develop advanced sensors for enhancing

“One of the greatest weaknesses in the US semiconductor industry today is the . . . reliability of semiconductor manufacturing equipment.”

process control on production lines, new processes to support manufacturing requirements for future generations of technology, and process models to support both of these activities.

“Sandia’s expertise in developing reliability modeling techniques makes it particularly suited for tackling the reliability problems of the IC equipment industry,” says Harry Saxton, Director of Semiconductor Components 2100. “Sandia’s results-oriented experience, combined with our knowledge of IC design and processing, will enhance SEMATECH’s programs for improving the performance of US chip-making equipment.”

Sandia stands to gain too, he notes. “The Labs will benefit by the activities of making new capabilities competitive in the marketplace. The experience will sharpen the skills we need to deliver new systems to our DOE and DoD customers on time — and at minimum cost.”

Harry is SEMATECH’s point of contact at Sandia.

Large-Scale Cooperative Effort

Many organizations throughout the Labs will be involved in SETEC, according to Wayne Johnson, supervisor of Surface-Processing Sciences Div. 1126.

SANDIA’S EXPERTISE in reliability modeling makes it particularly suited for tackling the reliability problems of the IC equipment industry, notes Harry Saxton, Director of Semiconductor Components 2100. Harry is SEMATECH’s point of contact at Sandia.



Officials Comment About SETEC

“This program with Sandia exemplifies the cooperative partnership we have with government, academia, and industry. SEMATECH member firms and US equipment and materials manufacturers will be working with Sandia on tool reliability enhancement, modeling, and advanced methodologies.”

*Bob Noyce, President and
CEO of SEMATECH*

“SEMATECH is using a national resource primarily associated with defense-related work to raise the American standard of living by improving the electronics industry, this nation’s largest employer. That is one of the things that makes this relationship so unique. This contract represents a synergistic use of two national assets — Sandia National Laboratories and SEMATECH.”

Senator Pete Domenici

“This agreement between SEMATECH and Sandia Labs emphasizes the value and importance of the relationships between industry, academia, and our national labs. Semiconductors and the entire electronics industry are key components in the US industrial base and essential elements of US national security. I am proud that New Mexico will play a key role in helping the US remain in the forefront of this crucial industry.”

Senator Jeff Bingaman

“We are pleased to participate in the vital task of increasing the nation’s competitiveness through enhanced cooperation with industry. This program underscores Sandia’s deep commitment to technology transfer and promises to become a model for future joint ventures between DOE’s national laboratories and industrial consortia.”

Al Narath, Sandia President

Wayne teamed with Jim Gerardo, manager of Laser and Chemical Physics Research Dept. 1120, to coordinate the development of SETEC with SEMATECH officials.

Wayne and Jim followed up on the results of a National Research Council workshop, “The Semiconductor Industry and the National Laboratories: Continuing the Joint Planning,” that was hosted at Sandia in May 1987 by Fred Vook, Director of Solid State Sciences 1100.

The workshop identified specific areas of research needed by the semiconductor industry and relevant research capabilities within the national laboratories that could address those needs. It was the first meeting in which the technical capabilities of the national labs and the technological “road maps” of the US semiconductor industry were shared.

“It’s taken us about a year to work out the technical, legal, and management issues for this program,” says Wayne. “The successful completion of this agreement paves the way for other

programs in which Sandia can team with industry to improve the US’s competitiveness in world markets.”

“It’s especially gratifying to me that SETEC work will be done through the cooperation of so many different Sandia organizations,” says Jim.

SETEC has three primary tasks, he explains.

In the first task — Equipment Reliability — Organizations 2000, 6000, and 7000 will apply reliability-analysis techniques to equipment currently being studied and modified in SEMATECH’s Equipment Improvement Program and develop reliability methodologies for designing and testing new equipment.

In the second task — Equipment Enhancement — Organizations 1000 and 2000 will develop diagnostic techniques and sensors for enhancing process control on production lines and do major studies in tribology (the

“The successful completion of this agreement paves the way for other programs in which Sandia can team with industry to improve US competitiveness in world markets.”

science of friction and wear) to reduce levels of wafer contamination by particulates generated by mechanical parts of equipment.

In the third task — Modeling and Advanced Methodologies — Organizations 1000, 2000, and 8000 will evaluate existing codes, develop new theoretical techniques for designing and analyzing chemical reactors and processes, and determine the feasibility of new processes and equipment. ●DR

Fun & Games

Tennis — Results of the Sandia Tennis Association tournament July 22-23 at the Coronado Club courts: Men’s A Singles — Kevin Maloney (6412) defeated Darryl Bouchard (2523); Men’s B Singles — Roy Palmer (2825) defeated Rafe Guidice; Men’s Doubles — Tim Draelos (9243) and Andy Schirber defeated Ed Fronczak (7262) and Vollney Hilldreth. Joe Tillerson (6314) and Pat Fleming (9243) were tournament coordinators. The next tournaments are the Labor Day weekend tournament Sept. 2-4 and the Fun Doubles tournament in October. For information, contact Kevin Maloney on 6-6578 or Ken Hanks (7823) on 4-1820.

Japan Dominates Mass Memory-Chip Market

Noyce on State of the Semiconductor Industry



BOB NOYCE

Robert (Bob) Noyce, President and CEO of SEMATECH, recently took time out for a telephone interview with LAB NEWS. Excerpts from that discussion are below.

Noyce, regarded as one of two "fathers of the integrated circuit," is also vice-chairman of Intel, a company he co-founded. He has served on the

President's Committee on Industrial Competitiveness and the Defense Science Board and was a founding member and first president of the Semiconductor Industry Association.

LN: What are SEMATECH's main concerns about the US semiconductor industry?

Noyce: Our greatest concern involves the repeatability and reliability of equipment — of the tools used to make semiconductor chips — particularly as we get farther along in automating the processes, in linking several tools together, for instance. We can't do that if each piece does not work consistently and reliably. We obviously have the fundamental concern of being able to get to smaller and smaller structures, but after you get that done, repeatability and reliability become essential in determining the cost of the product.

LN: US chip companies reportedly produce only one-tenth of this country's memory chips — the highest-volume chip products, a market Japanese suppliers now dominate. Some say the world semiconductor industry is evolving away

from mass manufacturing toward limited factory runs of high-performance specialty chips and that the US should concentrate on these specialized markets and avoid the high-volume manufacturing sector already dominated by the Japanese.

Noyce: Application-specific ICs — the "niche" markets — can't displace the mass memory markets at all. Memory chips are technology drivers: they provide us the mass-production know-how and the profits to fund advanced R&D. If you have one thing that you can run over and over again consistently, rather than short runs, then you can improve the techniques that you are using and make them work the same every time. It's awfully hard to do that when you're producing small numbers of things and can't compare what you did yesterday with what you're doing today.

LN: Market researchers say Japan will overtake the US in worldwide sales of semiconductor manufacturing equipment next year. Already, they say, 30 percent of the equipment used by US semiconductor companies is Japanese-made, and that, unarrested, that figure could double in the next five years. Does this sound like an accurate estimate to you?

Noyce: Yes it does. That's the best estimate we have.

LN: What is wrong with US companies using Japanese-made equipment?

Noyce: The concern, of course, is that the real interest of the Japanese is the downstream products — computers, telecommunications equipment, industrial automation equipment — and not the semiconductor manufacturing equipment itself. If equipment is the real interest, the

tendency [of the Japanese equipment manufacturers] might be to supply the Japanese semiconductor manufacturers with the most advanced equipment and withhold it from US manufacturers. If the real battle is the product later on, we don't want to be dependent on our principal competitor. It's sort of like saying that we'll let the Russians make our weapons for us. To retain control of the computer industry, we must retain control of the elements of it — and that's semiconductor chips.

LN: Some people say that SEMATECH can't solve the chip industry's problems by developing state-of-the-art equipment in a prototype semiconductor plant any more than General Motors has been able to solve its competitive problems by constructing automated automobile factories.

Noyce: Better technology is not the whole answer. If you look at the history of the American industry, the supplier/customer relationship has been a stormy one — one of the customer writing specifications, demanding that they be met, and threatening not to buy if they aren't. Instead, customer and supplier should sit down together to solve the problem. We're working toward that kind of relationship in the semiconductor industry. That's well evidenced by the fact that one of the board members of SEMATECH is the head of the semiconductor equipment and materials supply organization. There are 138 companies in that organization. We have regular meetings between our full board and their full board, talking about relationship problems between supplier and customer. We're addressing the issue of relationships because it is absolutely crucial for solving this problem.

May 1989 Earnings Factors

	Earnings Factors
Savings Plan for Salaried Employees (SPSE)	
AT&T Shares	1.0217
Government Obligations	1.0082
Equity Portfolio	1.0354
Guaranteed Interest Fund	1.0072
South Africa Restricted Fund	1.0415
Diversified Telephone Portfolio	
Unrealized Appreciation	1.0455
Realized Appreciation	.0001*
Savings and Security Plan — Non-Salaried Employees (SSP)	
AT&T Shares	1.0217
Guaranteed Interest Fund	1.0070
South Africa Restricted Fund	1.0488
Diversified Telephone Portfolio	
Unrealized Appreciation	1.0449
Realized Appreciation	.0001*

* The 1 has been removed from the earnings factor. Current month's DTP earnings may be calculated directly: Earnings Factor X DTP Current Worth = Current Month's Earnings.



A REAL WORKHORSE — As of June 1, Sandia's Lightning Simulation Facility had delivered 2845 "zaps" during a seven-year period. The facility, used for testing lightning effects on weapon electronics, began operation in 1981; shot records have been kept since May 1982. Electromagnetic Testing Div. 7554 runs tests almost every day, according to supervisor Larry Scott. Simulation of direct lightning strokes or nearby lightning is possible, depending on test requirements. Here, facility operations engineer Connie Chocas and data acquisition system technician Fred Helsel (both 7554) ready a weapon storage container for a nearby-lightning test. Current from high-voltage output bushing at back of 20-ft.-long test chamber flows down the center conductor (a copper pipe that's five feet above test object), then is distributed evenly by the 16 copper tubing return path conductors equally spaced around the circumference of the test chamber (foreground).

Can You Tell Me How to Get to Sesame Street?



Big Bird knapsacks and lunch boxes are all the rage in Japan — but with teenagers, not toddlers. Teenagers, in fact, are the main viewers of Sesame Street in Japan. Using an accompanying textbook, they study English by watching the long-running educational program, which airs only on weekends.

Wall Street Journal

(Continued from Page One)

Training Course

periodic visits to nuclear facilities in the Agency's member states to verify facility records of nuclear-material presence and/or transfers and to verify all nuclear material in the facility.

"Containment and Surveillance devices," explains Cecil Sonnier (DMTS, 5217), course director and Labs International Safeguards coordinator, "are installed in IAEA nuclear facilities to maintain continuous knowledge about the presence or movement of nuclear material during the period between inspectors' visits.

"The devices operate unattended for long periods of time between inspections — sometimes months — and it goes without saying that

"Our involvement in IAEA support was a direct outgrowth of the experience and expertise we'd acquired from weapon- and satellite-development activities."

they must be reliable and tamper-resistant, because C/S data are fundamental to the inspectors' reports to IAEA."

Examples of such devices, Cecil says, are seals on equipment that would indicate the continued presence of nuclear material within a container; optical surveillance devices — such as closed-circuit TV systems; and monitors to provide a record of material presence and transfers, declared or undeclared.

Objectives of the recent course, sponsored and funded by the US Program for Technical Assistance to IAEA Safeguards (POTAS), are to explain the role of C/S in IAEA safeguards, to describe C/S equipment developed by Sandia and others that's either in current use or under development, and to identify typical safeguards applications of existing and future C/S equipment.

Labs' IAEA Support

Sandia's international safeguards activities — aimed at increasing the efficiency and effectiveness of International Atomic Energy Agency (IAEA) safeguards — began in the late '60s. The Labs' early work in this critical area was a natural extension of the experience and expertise gained from its weapon- and satellite-development activities.

The Labs' international safeguards activities fall into two major categories: IAEA direct support and the DOE International Safeguards Program.

In the former category, early Containment and Surveillance (C/S) activities included the design, development, and evaluation of bundle counters that detect and record the transfer of spent-fuel bundles from heavy-water reactors to the fuel storage pool; a camera for continuous surveillance of reactor spent-fuel storage pools; an unattended doorway nuclear-material monitor with data-storage, tamper-protection, and optical-surveillance features; and various kinds of monitors.

Participation in POTAS

Direct support of IAEA has also included Sandia participation in the US Program for Technical Assistance to IAEA Safeguards (POTAS), which was initiated in the mid-'70s. The program's objective is to provide near-term support for IAEA's urgent needs in safeguards equipment, training, system studies, and information processing and evaluation.

Sandia POTAS activities include improving

'One of the Best ...'

Comments From Participants



DON AMUNDRUD

During the recent training course for International Atomic Energy Agency inspectors (see main story), two of them took time out to discuss the course with the LAB NEWS.

Before Don Amundrud of Canada became an inspector in January 1988, he worked for two years at IAEA Headquarters as a specialist in safeguards equipment for CANDU (heavy-water) reactors. Previously, he was with Atomic Energy of Canada Limited.

Don, who's assigned to the IAEA inspection team in Japan, has made four inspection tours — each four weeks long — in that country since he became an inspector.

"Though I had heard about various kinds of Containment and Surveillance [C/S] equipment at the basic training course for new inspectors," says Don, "so far, I've used just one type of C/S seal.

"Therefore, for me, the most valuable aspect of this training course has been the chance to get some hands-on experience with new equipment that I hadn't seen before. I really like to operate equipment, so this is right up my alley.

"It's impressive to me," Don continues, "that Sandia has hired an educational consultant

[Paul Ebel] for this course to make sure that we get the best training possible. And, from a learning standpoint, I find the lecture, demonstration, and hands-on sequence very useful."

David Hope of the UK worked 30 years at the Sellafield Reprocessing Plant on England's northwest coast before he became an IAEA inspector a year ago. "I was an operations man [at Sellafield]," says David. "So this second career — being an IAEA inspector — is a very different kind of a job."

Like Don Amundrud, David is assigned to IAEA's inspection team in Japan. His enthusiasm for the training course is obvious: "This is one of the best courses I've ever taken. The instructors' training capabilities are fantastic. Their notes were good, their presentation was good.

"The diversity of equipment I've seen here is fascinating. There's some stuff I haven't seen before, and I can envision using it in my work. If I can see an application for it in my assignment, I'll seek more extensive training in Vienna.

"One of my main responsibilities is to improve the quality of safeguards at IAEA facilities I inspect, and I think what I've learned in this course will help me do that."

"The training course serves as an introduction to C/S technology for inspectors," says Cecil. "And, although we demonstrate seven or eight different kinds of equipment at these sessions, they're not training courses *per se* on equipment operation and installation. Inspectors get that kind

of training at IAEA Headquarters in Vienna.

"Most of the inspectors who come here for training are relatively new at the job, and it's the first time they get exposure to equipment that's under development. From their standpoint, that's one of the course's most valuable aspects." (See "Comments From Participants.")

Sandia's international safeguards activities began in the late '60s, according to Div. 5217 supervisor Dennis Mangan. "At that time, most of our projects were sponsored by the Arms Control and Disarmament Agency," says Dennis. "Our involvement in IAEA support was a direct outgrowth of the experience and expertise we'd acquired from weapon- and satellite-development activities." (See "Labs' IAEA Support.")

Lead-Lab Role

"Because of our long-standing involvement with the program, Sandia is the lead lab in the US for C/S technology," Dennis continues. "That's why we've had the training responsibility from the beginning."

Labs C/S activities are sponsored by both the DOE International Safeguards Program and POTAS, Dennis notes. Equipment development activities are sponsored by DOE until a device demonstrates feasibility. At that point, if IAEA is interested in adopting the equipment, the project is transferred to POTAS for completion to the point of acceptance.

Besides Cecil and Dennis, other members of the staff for the recent training course were Darryl Drayer, Betty Fleming, Mary Lynn Garcia, Bill Hale, Charles Johnson, Robert Martinez, Sig Schneider, Lee Schoeneman, Gayle Self, Rob Tooley, Kenneth Ystesund (all 5217), and Rebecca Horton (5212). Paul Ebel of BE Inc. (a South Carolina company) served as training consultant. ●PW



Why Things Stick — and Why They Don't**Sandia Wins in 'New Initiative' Competition With Proposal in Science of Interface Adhesion**

Predicting the performance of cutting tools, the wear and friction of hard materials, the adhesion of thin films, or the survival of sensors in hostile environments such as engines, turbines, or photovoltaic systems is now mostly a matter of experience — trial and error. A new Sandia research program, starting next year, could put material selection on a more scientific footing.

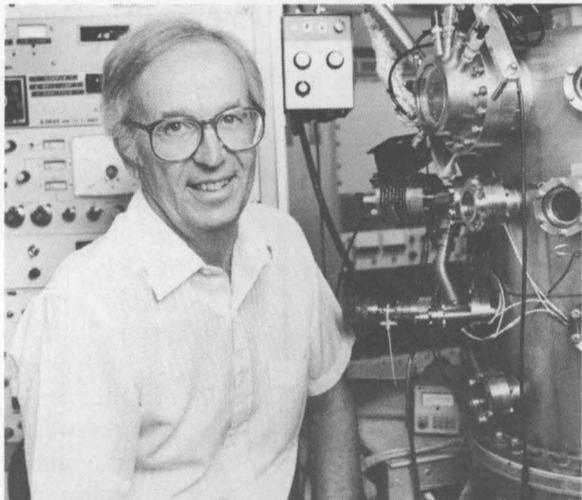
The program will be a result of Sandia's winning, for the fourth time in five years, a New Initiative grant from DOE. This year's winning proposal, from a team led by Terry Michalske,

Sandia's total of four successful proposals since the competition began five years ago is double the next-highest score.

supervisor of Surface Sciences Div. 1114, is titled "Atomic Level Science of Interfacial Adhesion."

The Division of Materials Sciences, in DOE's Office of Basic Energy Sciences (BES), will provide funding for three years, beginning in FY 1991. If the program yields good results, support could continue.

Each national laboratory and university involved in materials research funded by BES is



ONE OF SIX principal investigators, Jack Houston (DMTS, 1114), will be working in interfacial force microscopy. Other SNL principal investigators are in the group photo.

eligible to submit two proposals each year. The proposals — 21 of them this time — are judged by the staff of the Materials Sciences Division. This year, three winners were selected. Sandia's four successful proposals (including one in collaboration with Lawrence Livermore Lab) since the competition began five years ago is double the next-highest score — four other labs and universities have had two winners each.

When Sandia's team gets its program under way, the object will be to develop new knowledge about what happens when materials are in contact. "Our interest is in why materials stick together — and why they don't," says Terry. "That question has lots of applications. Sometimes you want things to be lubricated, to slide smoothly without wear. And sometimes you want them to stick together, as in composite materials."

Interplay of Theory and Experiment

"We'll be working to develop a fundamental understanding of things that have before been known mostly through trial and error," Terry continues. "That will take both theory and carefully controlled experiments. The two play off each other and strengthen each other. We'll use our new knowledge to draw conclusions about how real



INTERFACE-ADHESION RESEARCH TEAM named in Sandia's successful "New Initiative" grant proposal includes (standing, from left) Tom Klitsner (1114), Peter Feibelman (DMTS, 1151), Terry Michalske (1114), Charles Peden (1846), Paul Taylor (1153), and Brian Dodson (1143). Seated is Fred Vook (1100). Team members not shown in photos are Gary Kellogg (1114), Merrilea Mayo (1845), Neal Shinn (1114), Abhaya Datye (UNM), and Gary McClelland (IBM-San Jose).

systems behave, when conditions aren't as tightly controlled as in our experiments. If we can understand the physical and chemical interactions that bind surfaces together, we can help people improve on trial-and-error methods when they select materials."

The team's plan is to use atomic-scale instruments for measuring how forces between atoms of

"Sometimes you want things to be lubricated, to slide smoothly without wear. And sometimes you want them to stick together."

two contacting materials vary with separation, to make theoretical calculations of the bonding forces, to do experiments for verifying and refining the theory, and to do larger-scale experiments relating fundamental knowledge with practical questions about how materials adhere.

Terry contrasts his team's plan with more conventional ones: "Many times, approaches to a problem like this begin with the most complex surfaces and situations. But that way, it's hard to isolate the scientific principles. We'll start with carefully controlled experiments in ideal situations, then branch out and extend our knowledge to real-world problems."

Such a program demands collaboration. That's one thing Sandia excels in, says Fred Vook,

Director of Solid State Sciences 1100: "There's an excellent interrelationship between staff members in my organization, Bob Eagan's Materials and Process Sciences [1800] group, and Peter Mattern's Combustion and Applied Research [8300] group. For instance, Terry 'grew up' in 1800 and was recently promoted as a supervisor in 1100.

"Most of our proposals have involved staff members from several groups, and this one is no exception. One of Sandia's strengths is the way we can put together a team of many disciplines — physics, ceramics, chemistry, metallurgy, computing, solid-state theory, quantum mechanics. These cross-disciplinary areas are where we find the most opportunities for new work."

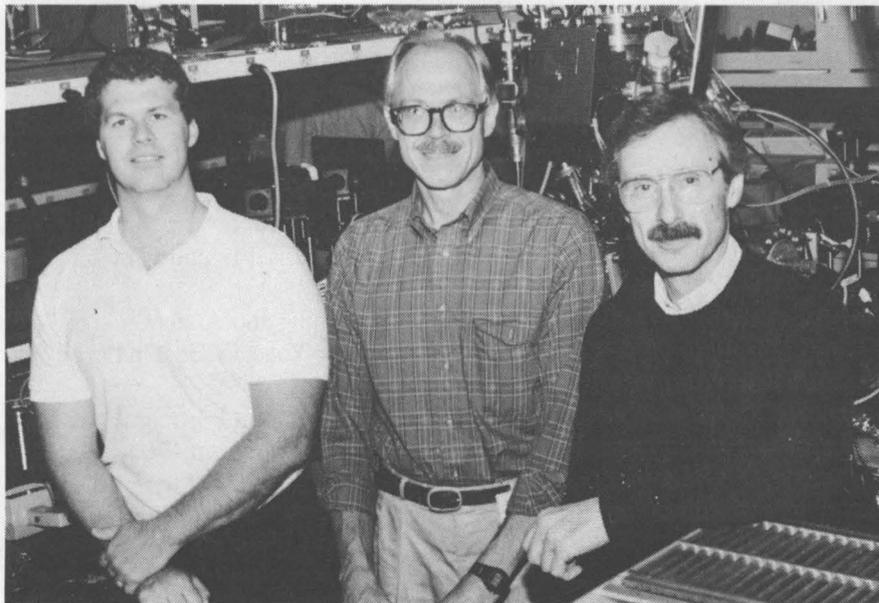
Using Tools Creatively

The team will employ many of the latest tools of surface science. For instance, says Terry, "The

"We'll start with carefully controlled experiments in ideal situations, then branch out and extend our knowledge to real-world problems."

atomic force microscope, with its atom-sized tip, is a key to the planned work. It can measure an extremely small force — down to that between two atoms attracting or repelling each other. Usually

(Continued on Page Nine)



OTHER RESEARCHERS who'll be working on the interface-adhesion program are (from left) Jeff Nelson (1143), Dick Anderson, and Marshall Lapp (both 8342). They're in the Laser Spectroscopy of Surfaces Lab; behind them is a vacuum chamber instrumented with surface and interface diagnostic probes.

Unusual Vacation

Leningrad: Not Exactly Paris, but No Red Square Either

ART DuCHARME (6513, left) AND JACK JACKSON (9241) in Leningrad. Behind them rises the slender church spire of the Peter and Paul Fortress, built by Peter the Great — the city's founder — in 1703.



To sharpen your skills in the Russian language, where would you go but to Leningrad — the place where the Russian language, in the hands of Pushkin, came into its own?

That's where Jack Jackson (9241) and Art DuCharme (6513) headed last December, when they decided to combine a winter vacation with an intensive three-and-a-half-week language course. Both are instructors for Russian courses offered in Sandia's Out-of-Hours program.

"We wanted to improve our conversational skills, as well as get a firsthand glimpse of Russian culture," says Jack.

Joining a tour group in New York, Jack and Art flew to Zurich via Swissair and then to Leningrad via Aeroflot, arriving late in the evening.

"Landing at Leningrad was an eerie experience," recalls Jack. "Russian cities aren't as brightly lit as American cities — and, with a fresh layer of snow, Leningrad seemed surrealistically still and hushed."

Reading, Writing, and Razgavor

Classes began early the next day.

"We were placed in classes according to our level of competence in the language," says Jack. "Some hardly knew the Russian alphabet, others were already quite proficient. Art and I were placed in the same class along with eight others: five Americans, two Brits, and a Swiss. The rest of our tour group — 35 in all — were placed in four other classes about the same size."

Held in the Pulkovskaya Hotel where the tour group stayed, the classes were conducted entirely in Russian and met every morning, Monday through Saturday, until noon. "The emphasis was on Razgavor — conversation — but we were also assigned reading and writing exercises as homework," says Jack.



CHANGING OF THE GUARD — A group of Pioneers (All-Union Lenin Pioneer Organization for Soviet school children between the ages of nine and 14) heads home after honor-guard duty at the World War II memorial in Novgorod, near Leningrad. "The weather was so extreme, they stood on wooden blocks during guard duty to help protect their feet from the cold ground," says Jack.

"The teachers were excellent," he adds. "All were professional language instructors who regularly taught Russian to foreigners. Our instructor, Rozaliya Valeninovna Kruikovekaya, spoke only 'ten words' of English — or claimed that's all she spoke — so we weren't tempted to slide back into our native language during classes.

"Even out of class, we continued to speak Russian among ourselves and with the Russians we met. We also watched TV as much as possible. Art even left the set on while he napped — and claimed 'subliminal improvement.'"

Not 'All Work and No Play'

"We didn't spend all of our time studying," says Jack. "Afternoons, evenings, and Sundays, we joined planned excursions to historical and cultural sites in and around Leningrad — the Hermitage, a colossal collection of buildings and surely one of the greatest



GHOSTLY GRANDFATHER FROST — the Russian equivalent of Santa Claus — appears to emerge from the snow. "The Russians seemed very fond of snow heads," says Jack, "but we saw no snowmen."

museums in the world; the Russian Museum; Victory Square; the Peter and Paul Fortress. Or we struck off on our own to visit other places or to shop on Nevsky Prospect, Leningrad's main boulevard.

"There's plenty to do in Leningrad. The city has 80 cinemas, a circus, 14 permanent theatres — among them, the famous Kirov and Maly theatres — and a world-class symphony orchestra. We enjoyed seeing 'Swan Lake' at the Kirov and 'The Czar's Bride' at the Maly.

"The really striking thing about Leningrad is that it's so loaded with history. You can see it in the city's architecture and monuments."

Jack cites the Peter and Paul Fortress. Peter the Great began building the Fortress in 1703, and this date is regarded as the beginning of the city's history. In the Fortress — where Peter had his son beaten to death — Lenin's brother, and later Kropotkin, Trotsky, and Gorky, were prisoners.

"Almost every building erected by the czars and czarinas is overlaid with more recent, historical events such as the February and October revolutions in 1917," he notes.

Allowed to Move About Freely

"We were allowed to move freely about and had many opportunities to meet and talk with Soviet citizens," Jack says.

"Some meetings were formally arranged, meetings between professionals in our group and their Russian counterparts, for example. Our entire group met with a group of medical and language students from local universities."

These meetings and tours often led to personal invitations to private homes, notes Jack. "The Petrov family, which Art and I met while touring the medieval town of Novgorod near Leningrad, invited us to their home for the next evening."

Typical Middle-Class Family

"The Petrovs were a fairly typical middle-class family. Both parents were professionals — the father was an industrial engineer and worked for a company that refurbishes rail cars; the mother, a teacher. Living with them in their small, but comfortable, apartment was their nine-year-old son and the maternal grandmother.

"Salaries for professionals and skilled crafts people run about 110 to 250 rubles [\$176 to \$400] per month," explains Jack.

"But rent and utilities are kept low. The Petrovs said the rates hadn't been increased for almost 40 years. Their rent is 13 kopecks (21 cents) per square metre of living space per month; hot and cold running water, 50 kopecks (80 cents); and natural gas, a flat 75 kopecks (\$1.20).

"Every apartment we visited had a black and white TV set and a telephone. Rates for local calls seemed pretty reasonable — two-and-a-half rubles a month (\$4.00) — but long-distance calls cost extra, depending on the distance. A call from Leningrad to Moscow, for example, is 15 kopecks (24 cents) per minute, but a call to the US costs more than 60 rubles (\$96) for just a few minutes.

"In all, the typical Soviet city-dwelling family spends only about four percent of its monthly take-home pay for rent and utilities." But, he notes, waiting lists for apartments are long — many young married couples must live with one set of parents for several years before getting their own apartment.

Jack says the tour was expensive, but well worth it. He recommends it to anyone interested in Russian language, history, or culture. ●DR



BORYA, nine-year-old son of Russian family that Jack and Art visited. "Borya cleaned my clock in a chess game," says Jack. "He had me in just eleven moves. What's worse, he even critiqued my game afterward." Borya wears a child's version of the Baltic Fleet's naval uniform. "It's a popular item with Russian children," Jack notes, "something like the G.I. Joe uniforms that used to be so popular with American kids."

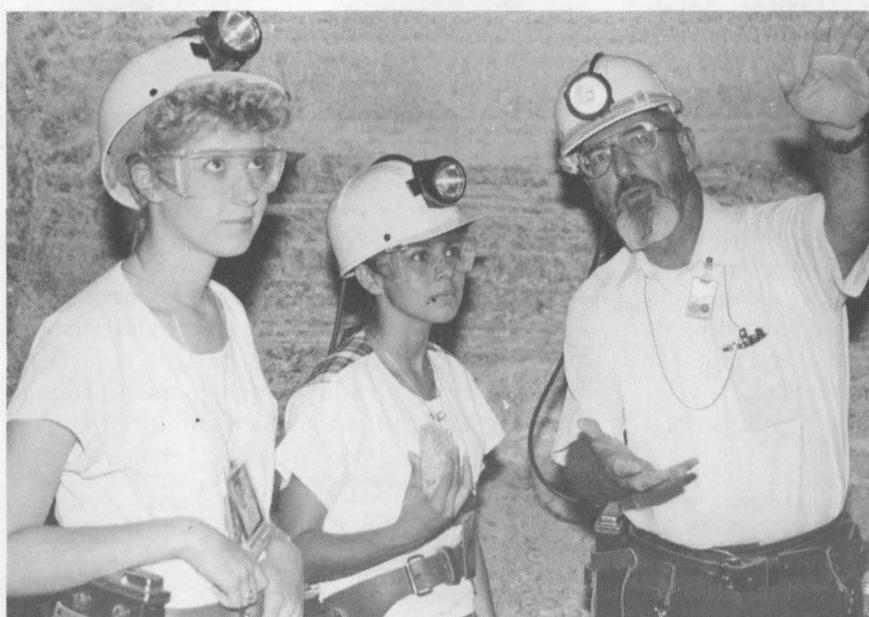


THE "CLASS OF '89" YOTs (Youth Opportunity Trainees) gathered for this group photo recently before heading back to school. Soila Brewer (3533) coordinates the YOT program, which each year brings promising students to Sandia for summer jobs. Teachers in area high schools, colleges, and vocational schools recommend capable and deserving students for the YOT program.

Fun & Games

Bowling — The Sandia Women's Bowling League has openings for bowlers for the 1989-90 season. League play starts Aug. 31 and ends in early May. Bowling is every Thursday night; bowlers of all skill levels are welcome. Call Sally Frew (3522) on 296-8584 for information.

Golf — Sept. 8 is the registration deadline for the annual Hispanic Heritage Golf Tournament on Sept. 11 at Tijeras Arroyo Golf Course. Entry fee of \$35 includes green fees, refreshments, awards, and a free golf clinic after the tournament. Proceeds will go to the American G.I. Forum (national Hispanic veterans organization) for its scholarship program. For details and entry forms, call Tom Cordova (3411) on 296-8785.



UNDERGROUND YOTs — Tabitha Roslin (left) and Jessica Rojo were Sandia's first summer YOTs at the Waste Isolation Pilot Plant near Carlsbad. Here, they get a lesson on the dynamics of WIPP rock salt from Tom Schultheis (6333). The two Carlsbad Senior High grads are attending New Mexico State University at Carlsbad this fall. They are the first YOTs to work outside of Albuquerque. (Photo by Alan Rostro, Westinghouse Electric Corp.)

(Continued from Page Seven)

New Initiative

this kind of microscope is used to profile the surface structure of materials, by keeping a small constant force and moving the tip along a material's surface to show the locations of the atoms. But we will be doing the opposite — measuring how the forces between atoms vary with the distance."

Terry says that another important measurement tool will be the scanning tunneling microscope. Several types of surface spectroscopy also will be used to learn about the characteristics of material surfaces and to provide data for the theoretical models that will be developed during the research program.

Combining all these techniques will require a sizable and varied team. It will include Sandians at both Albuquerque and Livermore, plus outside researchers. Named in the proposal as principal

"We don't want to follow a fad, to be a 'me, too' institution. But we don't want to be so far out of the mainstream that the odds of success aren't reasonable."

investigators are, besides Terry, Dick Anderson (8342), Brian Dodson (1143), Jack Houston (DMTS, 1114), Tom Klitsner (1114), and Gary McClelland (IBM-San Jose). Other team members are Peter Feibelman (DMTS, 1151), Gary Kellogg (1114), Marshall Lapp (8342), Merrilea Mayo (1845), Jeff Nelson (1143), Charles Peden

(1846), Neal Shinn (1114), Paul Taylor (1153), and (from UNM) Abhaya Datye.

Research Whose Time Has Come

Dick Kelley of the DOE's BES/Materials Sciences Div., who chaired the review process, emphasizes the appropriate timing of Sandia's proposal: "We believe the experimental tools and theoretical capabilities exist to undertake this type of approach, so the timing's right. And the Sandia group is one of the best in the world to undertake this kind of effort. They put together a proposal that made it quite clear that they can address the physics and chemistry of interfacial bonding in a first-class way at the atomic level."

Fred Vook also thinks the timing is right: "Surface physics researchers have been investigating material surfaces for a long time now. People have developed instruments to 'see' atoms — the field ion microscope, the scanning tunneling microscope, the atomic force microscope.

"Now, interest has come around not just to single surfaces, but to interfaces between surfaces, to impurities and defects. So, from that point of view, our proposal was timely. We look for things like this. We don't want to follow a fad, to be a 'me, too' institution. But we don't want to be so far out of the mainstream that the odds of success aren't reasonable. What we want — and what we've got here — is a logical area to proceed in, one that's ripe for exploitation." ●CS

Vook Tallies the Totals

As Sandia's program manager for work funded by DOE's Office of Basic Energy Sciences/Division of Materials Sciences, Fred Vook (1100) keeps tabs on how well Sandia does in BES competitions.

So far, he has a lot to smile about. One thing is the New Initiative competition. The Division of Materials Sciences sets aside two percent of its annual budget to fund New Initiative winners, resulting in three-year grants of about a half-million dollars per year to each of the new programs. Fred doesn't yet know the exact amount that the latest Sandia winner (see main story) will be getting.

With only a small percentage of Materials Sciences' annual research budget coming to Sandia — currently about four percent, says Fred — the Labs has established a strong

enough program to lead the field in both the New Initiative grants and the annual Materials Science Research Competition.

After the first five years of New Initiative competitions, Sandia has won four of the 15 grants made. Four other institutions have won two each.

Sandia has received nine Materials Sciences research awards; the next-highest is six.

How has Sandia achieved such a record? Says Fred, "We have good people, good ideas, and — maybe I shouldn't say it, since I'm in management — good management."

He also notes the breadth of recipients. "The research awards have involved a lot of staff members. It's not just a few who win repeatedly. Nearly 40 Sandians have been named in our nine awards."

New Imperative — Design for Quality**New INTEC Courses Focus on Quality**

Quality — what it is and how to design it into any product or process.

That's the focus of a broad new program of courses that will be offered by INTEC (In-Hours Technical Education Courses), beginning this fall. So far, the program consists of two new curricula: Design for Manufacturability and Project Engineering.

The objective of the Design for Manufacturability curricula is to help Sandia and DOE production agencies and other customers and suppliers work together to design and fabricate high-quality products that are not only reliable, but also easier to manufacture and more cost-effective. The Project Engineering curriculum focuses on how to manage and monitor the design and production processes in a way that builds in quality throughout.

"Quality is not something added to a product, or something achieved through inspections at the end of the production line," says VP of Component Development Glen Cheney (2000), chairman of the Sandia Education Committee. "Quality is conforming to customers' requirements."

Working Together at the Outset

Glen continues, "The courses in these new curricula are based on the idea that the way you get a quality product is by first clearly defining the requirements and then by having design engineers begin working with manufacturing professionals — at the very outset of a project — and together considering all elements of the product life cycle, including quality, cost, schedule, and performance."



BELINDA HOLLEY (right) and Wayne Trump (both 3522) provided the instructional design for INTEC's new course, "Design for Manufacturability."



SOME OF THE GRADUATES who participated in the pilot run of "Design for Manufacturability," a new course to be offered by INTEC this fall. The course is just one in INTEC's broad new program of courses that focus on designing quality into products and processes. This design team, one of four in the class, includes (from left) Mark Davis (1830); Frank Lonadier, EG&G, Mound Laboratory; Richard Merlini, Rocky Flats; Arlen Baldwin (2523), and Mike Rogers (8134).

"Decisions made early in the design stage can determine the manufacturability of a product. In other words, you design for quality — from the beginning."

The first of ten integrated courses that compose the Design for Manufacturability curriculum had its pilot run recently and is scheduled to be offered for the first time October 2-6.

"This first course presents an overview of the subjects that will be covered in the remaining courses," says Belinda Holley, who, with help from Wayne Trump (both 3522), provided the instructional design for the course. "It surveys key philosophies and concepts of quality and relates them to design and manufacturing processes."

The course targets those with design responsibility, says Wayne, but will also be useful to others, especially management: "The objective of the course is to train people in the art of integrating affordability, producibility, and performance to develop high-quality processes, services, and end products."

Prof. Joe Mullins, Director of Manufacturing, Engineering, and Industrial Relations at UNM, teamed with Jack Gallagher (2545) to develop the technical content of the course. They will co-instruct the course.

Supervisor of the course and curriculum coordinator is Nick Magnani, manager of Power

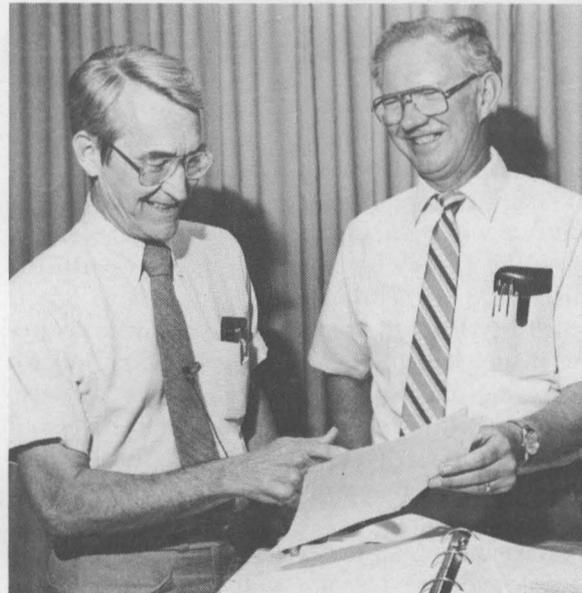
Sources Dept. 2520.

The Design for Manufacturability curriculum stresses the importance of teamwork among designers, manufacturing professionals, and support people throughout the product life cycle.

Ask Lone Ranger to Join a Posse?

"To some," says Jack Gallagher, "the concept of teamwork is like asking the Lone Ranger to join a posse. But who's to say the Lone Ranger, Batman, Wonder Woman, and Superman wouldn't make a spectacular team?"

"The objective of the Project Engineering curriculum is to provide information and experi-



JACK GALLAGHER (2545, right) teamed with Prof. Joe Mullins, Director of Manufacturing, Engineering, and Industrial Relations at UNM, to develop the technical content of "Design for Manufacturability."

ence in managing the design process, design process methodologies, and testing — at minimum cost," says Jim Renken, manager of Radiation Effects Dept. 2320. Jim is coordinating the courses for the curriculum; Charline Seyfer (3522) is instructional designer.

"Effective Design Review," a course in the Project Engineering curriculum, is scheduled for pilot in October and will come on-line in November.

Other courses in both curricula and two more new curricula will come on-line over the next two years. Development of the new curricula was initiated by the Continuing Professional Development Committee, chaired by Dick Schwoebel, Director of Components 2500.

•DR

Management Briefing On Design for Quality

A management briefing on the Design for Quality program is set for Sept. 1 in the Technology Transfer Center (TTC). It will be presented twice, once from 8:30 to 11:30 a.m., and again from 1:30 to 4:30 p.m. The briefing will be televised live to the Combustion Research Facility (CRF) auditorium at Sandia, Livermore, from 7:30 to 8:30 a.m., and again from 12:30 to 4:30 p.m.

Managers and supervisors should attend one of these sessions.

The purpose of the briefing is to inform Sandians of the new expectation in designing for quality and to introduce new courses to be offered by INTEC (In-Hours Technical Education Courses), beginning this fall (see main story).

Speaking at the briefing will be President

Al Narath; Executive VP Orval Jones; Glen Cheney, VP of Component Development 2000 and chairman of the Sandia Education Committee; Dick Schwoebel, Director of Components 2500 and chairman of the Continuing Professional Development Committee; and Prof. Joe Mullins, Director of Manufacturing, Engineering, and Industrial Relations at UNM.

A videotape of the briefing will be shown at a make-up session Oct. 27 in both the TTC and the CRF auditoriums from 1 to 4 p.m. Managers and supervisors at other locations may contact Rose Perea (3522), ext. 4-6723, to obtain a videotape.

Supervisors will be expected to present the complete briefing, or applicable segments, to their organizations.

Supervisory Appointments

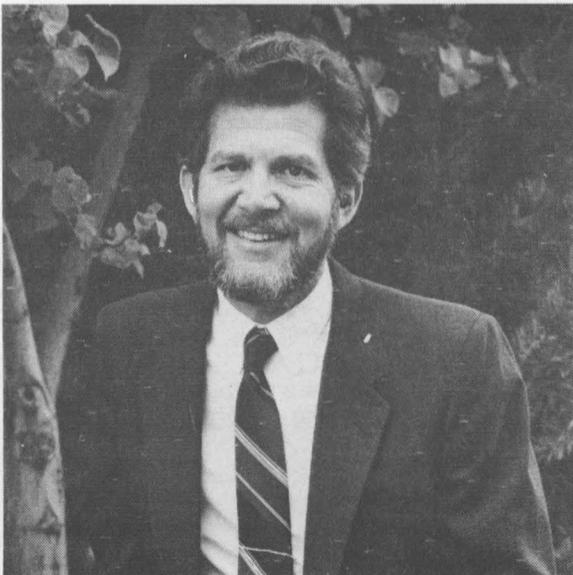


ROBERT ALVIS (DMTS) to supervisor of W76/Mk4 Div. 5154.

In February 1960, Bob joined Sandia's Production Tester Design Division, where he worked on design, fabrication, and testing of weapon component acceptance testers. He has been project engineer or leader for development of a reentry vehicle in the Advanced Reentry Vehicle Research Division, weapon development in the Advanced Systems Research and Development Division, deep-drilling-bit technology in the Advanced Drilling Division, several large power systems in the Solar Thermal Systems Development Division, and the Trident II Warhead Development Division.

He has a BS in mechanical engineering from the University of Oklahoma and an MS in the same field from UNM. Before joining the Labs, he worked for the Boeing Company in Wichita. He's a member of the Society of Professional Engineers and the Medical Aid Research Foundation. Bob received the UNM Distinguished Alumni Award in 1989.

His spare-time activities include gardening and church work. He and his wife Dorothy have one son and live in the NE Heights.



STANLEY FRALEY to supervisor of Verification Systems and Technology Div. II 9242.

Stan's work at Sandia has been in arms control verification since he joined the Labs in March 1985 as a member of the Systems Research Division. He served as liaison between Sandia and DoD's Office of Verification Policy. In 1987, he was a member of the delegation that went to Geneva to negotiate the Intermediate-range Nuclear Forces (INF) Treaty and was the US co-chairman of the joint US/USSR working group that negotiated the inspection protocol provision of the treaty. He received the Secretary of Defense medal for outstanding public service for his work on the treaty.

Since 1988, he's been project leader of the Technical On-Site Inspection program that has developed equipment to perform continuous monitoring of the Soviet missile-production facility at Votkinsk, under terms of the INF Treaty.

Stan has a BS and an MS in nuclear engineering, both from North Carolina State University, and a PhD in engineering science from the University of Tennessee. Before coming to Sandia, he worked for Union Carbide in Oak Ridge, Tenn., and the Arms Control and Disarmament Agency in Washington, D.C. From 1980 to 1985, Stan was a US State Department senior foreign service officer in Vienna, Austria.

Stan enjoys bicycling and unicycling, volleyball, amateur radio, and guitar. He has five children. He and his wife Huri live in the NE Heights.

NANCY FRESHOUR to supervisor of Information Systems Div. 7825.

In October 1980, Nancy joined Sandia's Procurement Systems Design Division, where she did systems analysis, design, programming, and production support for the Integrated Procurement



NANCY FRESHOUR (7825)

System (IPS). In 1987, she transferred to the Financial Systems Design Division, and then to the division she now heads. She was project leader for IPS production support, the Purchasing Information Management System, Facilities Management Information and Tracking System, and was system administrator of the Management Information and Data Access System.

She has a BA in music and physical science from the University of Washington, an MBA from Northern Arizona University, and has studied at several other universities.

Before joining the Labs, Nancy was a commercial fisherman in Alaska and taught school in Alaska, Colorado, and Germany.

She's a member of the Project Management Institute, Phi Kappa Phi, the Northern Arizona University MBA Curriculum Advisory Committee, and the YWCA Student Award Committee. She's served as a Sandia recruiter at NAU since 1981, has been a member of the Sandia Speakers Bureau since 1982, and is a volunteer science fair judge.

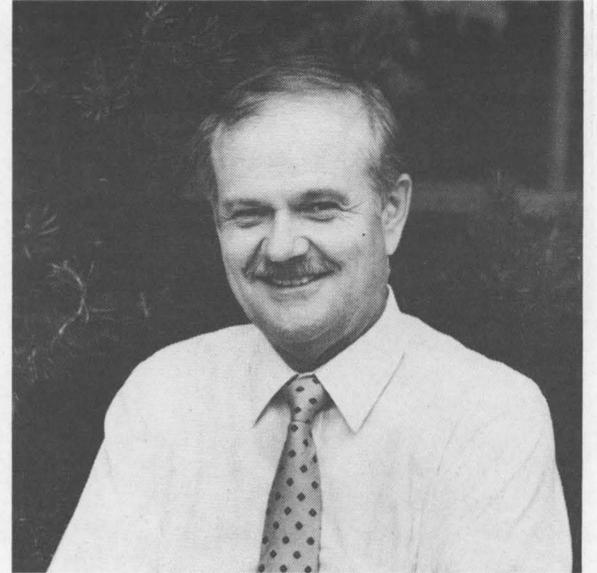
Nancy was YWCA Woman on the Move in 1986 and is on the Chamber of Commerce list of "Who's Who Among Corporate Women."

In her spare time, Nancy enjoys fishing, biking, camping, music, and working with computers. She has two daughters. Nancy and her husband Richard Smith live in NE Albuquerque.

JAMES JORGENSEN to supervisor of Integrated Circuits Div. I 2172.

Jim joined Sandia in 1966 as a member of the Radar Department. He was a circuit and radar subsystem designer on several projects, including the Mk3, Mk4, and B83 fuzing radars. In January 1980, he transferred to the Integrated Circuits Design Department as an IC designer, and in June 1980 was promoted to supervisor of Microprocessors and Memories Division 2115.

He left Sandia in 1984 to join Signetics in



JIM JORGENSEN (2172)

Albuquerque. He returned to the Labs in July 1988 as a member of the CRM Programs Department. He worked in a staff position for Directorate 2100 until his recent promotion.

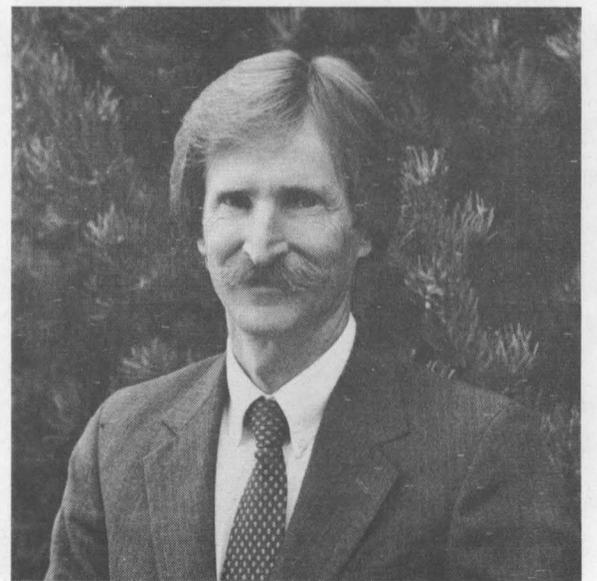
He has a BS and an MS from the University of Nebraska and a PhD from UNM, all in electrical engineering.

He's a member of the Institute of Electrical and Electronic Engineers, Eta Kappa Nu, Sigma Tau, Pi Mu Epsilon, and Sigma Xi. In 1984, he received the Award of Excellence, SA3000 Radiation-Hardened Microprocessor, from the DOE Office of Military Application.

Jim enjoys reading, golf, bridge, and yard work. He and his wife Jeanette live in the NE Heights. They have two grown children.

LARRY DALTON to supervisor of Electronic Subsystems Div. II 2337.

In July 1978, Larry joined Sandia's Entry Control Systems Division, where he developed personnel entry control systems for use at DOE's



LARRY DALTON (2337)

Hanford and Savannah River facilities. In 1981, he joined the Command and Control Division and worked on aircraft monitoring and control systems for nuclear weapons. He transferred to the Guidance and Control Division in 1984 and helped develop the Sandia Airborne Computer. Before his promotion, he performed special projects in Electronic Development Division II.

He has an AS in electronic technology from Southern Illinois University, and a BS in applied mathematics and an MS in electrical engineering, both from UNM.

He is a member of the American Institute of Aeronautics and Astronautics. He worked for Los Alamos National Laboratory before joining Sandia.

Larry enjoys woodworking, skiing, and gardening. He and his wife Elizabeth have one daughter and live in Bernalillo.

Supervisory Appointments

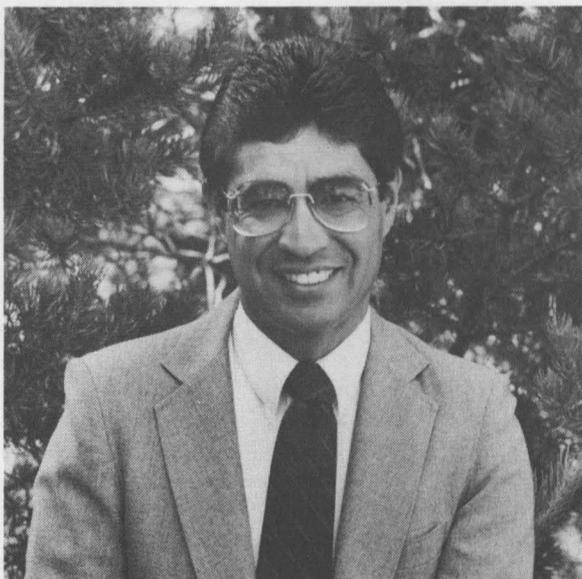


ROY HAMIL to supervisor of Technology Transfer Div. 6111.

Roy has been a member of the Laser Projects Division since he joined Sandia in May 1980. He did research on the high-energy excimer laser and on laser triggering of high-voltage switches. He was a functional representative on both the PBFA II and Hermes II accelerators.

He has a BS in engineering physics and an MS in physics, both from the University of Kansas, and a PhD in optical sciences from the University of Arizona. Before joining the Labs, Roy worked for Bendix (now Allied Signal) in Kansas City and served with the US Air Force. He's a member of the International Society for Optical Engineering.

Roy is an officer in the Air Force Reserve, assigned to the Air Force Weapons Lab chief scientist's office. In his spare time, he is also building a solar adobe house. He and his wife Joyce live south of Tijeras.



ORLANDO VIGIL to supervisor of Facilities Planning Div. 7821.

Orlando joined the Labs in August 1985 as a structural engineer in the Facilities Design Division. In 1986, he transferred to the division he now heads. He was project leader on Sandia's Site and Facilities Master Plan and Strategic Facilities Initiative Plan, chairman of the Traffic Liaison Committee, and Sandia's representative on the KAFB Traffic Engineering Working Group.

He has an AS in electronics technology from NM Highlands University, a BS in civil engineering from NMSU, and an MS in civil engineering from UNM.

Before joining Sandia, Orlando was a structural engineer for the Salt River Project Power Company in Phoenix and a civil engineer for the federal government. He is a New Mexico Registered Professional Engineer, a member of the American Society of Civil Engineers, and is currently president of the New Mexico Chapter of the Society of Hispanic Professional Engineers. He is also a member of Sandia's Hispanic Leadership and Outreach Committee.

Orlando's spare time is spent playing golf and

tennis and participating in church activities. He and his wife Barbara have three children and live in the NE Heights.

ALLAN FINE to supervisor of Safety Engineering Div. II 3216.

Al joined Sandia in November 1953 as a member of the Weapon Applications Division, where he was involved in warhead development for Army short-range missiles. His work at the Labs since then includes weapon feasibility studies, weapon safety studies, safeguards studies, security system design, and arms control studies and field operations. He joined the Health and Safety Department in 1981.

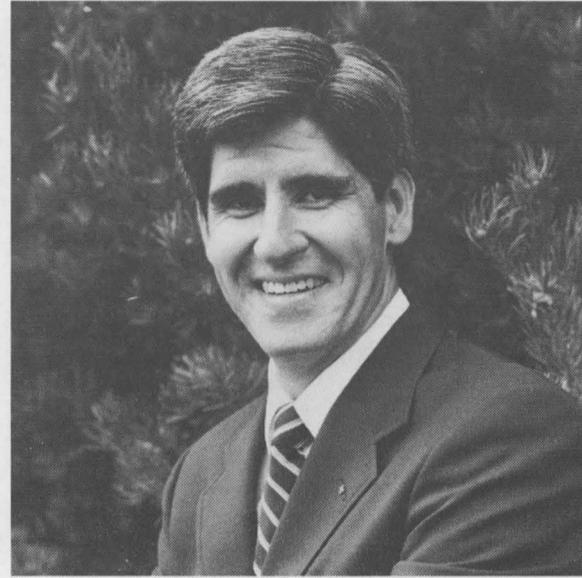
He has a BS and an MS in electrical engineering, both from the University of Louisville. He's a member of the American Society of Safety Engineers; vice-president for education of the Rio Grande Chapter, Project Management Institute;



AL FINE (3216)

and a charter member of Escribiente, an Albuquerque calligraphic society.

Al's spare-time activities include travel, music, art, reading, and calligraphy. He and his wife Maxine have three grown daughters and live in the NE Heights.



JAY SANCHEZ to manager of Labor Relations Dept. 3560.

Jay joined Sandia's Job Evaluation Division in August 1981 as a job analyst. He was chairman of the Joint Job Grades Study Committee. From 1984 to 1985, he was a member of the Labor Relations Department, where he participated in contract negotiations and development and implementation of Sandia's first Labor Relations Conference. He also participated in grievance administration and arbitration cases, and responded to unfair-labor-practice charges. In December 1985, he was promoted to supervisor of the Personnel and General Employment Division.

Jay has a BA in psychology and economics from UNM and an MBA in labor and human resource administration from Ohio State University. He's a member of the Industrial Relations Research Association, the Executive Council of Boy Scouts of America, and New Mexico Search and Rescue. He is a 1988 graduate of the Leadership Albuquerque program. He was an adjunct professor of management at UNM from 1981 to 1982 and, since 1982, has been an adjunct professor in labor relations for Webster University.

Jay enjoys running, fishing, hiking, and cross-country skiing. He and his wife April have three children and live in the NE Heights.

Events Calendar

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

Aug. 25 — New Mexico Storytelling: Spanish and Indian stories told by master storyteller Teresa Pijoan de Van Etten; 7-8 p.m., Elena Gallegos Open Space Park, free, 291-6224.

Aug. 25-30 — Los Voladores — Aztec Dancers, flyers soar down and around 80' pole until they reach the earth; call for times, Indian Pueblo Cultural Center, 843-7270.

Aug. 25-Sept. 10 — "Cartoons and Commentary on Photography," exhibit honoring photography's 150th birthday; 9 a.m.-4 p.m. Tues.-Fri. (5-9 p.m. Tues. evening); Van Deren Coke and West galleries, UNM Art Museum, 277-4001.

Aug. 25-Sept. 10 — Exhibit, "Mexican Ceramics from the Collection," showing of contemporary ceramic folk art and crafts from Mexico; 9 a.m.-4 p.m. (5-9 p.m. Tues. evenings); West gallery, UNM Art Museum, 277-4001.

Aug. 25-Sept. 17 — "Art Since 1945," paintings, sculpture, and prints from the permanent collection, highlighting later twentieth-century art (realism, geometric abstraction, and expressionism); 9 a.m.-4 p.m. Tues.-Fri. (5-9 p.m. Tues. evenings & 1-4 p.m. Sun.); upper gallery, UNM Art Museum, 277-4001.

Aug. 25-Sept. 30 — Exhibit, "Moon, Man, & Mars"; 9 a.m.-6 p.m., New Mexico Museum of Natural History, 841-8837.

Aug. 26 — "Dancing Through the Dec-

ades," presentation to benefit the American Lung Association, American and international dances; 7:30 p.m., Rodey Theatre, 265-0732.

Aug. 26 — Concert, classical music of India sung by Lakshmi Shankar, with Alope Dutta on tabla and Gopal Marathe on harmonium; 8 p.m., Woodward Hall, 242-0591 or 265-6544.

Aug. 26-27 — Fiesta Artistica: food, entertainment, fine arts, and crafts; 10 a.m.-7 p.m. Sat., 10 a.m.-5 p.m. Sun.; Albuquerque Convention Center, 768-3494.

Aug. 29 — Open house and exercise demonstration for seniors and disabled adults in celebration of third year of YWCA's "Physically Challenged and Determined Program"; 10 a.m.-12 noon, YWCA (7201 Paseo Del Norte NE), 822-9922.

Aug. 30 — Man, Moon, & Mars Speakers' Series: Former astronaut and Senator Harrison Schmitt speaks about "A Trip to the Moon"; 7 p.m., New Mexico Museum of Natural History; 841-8837.

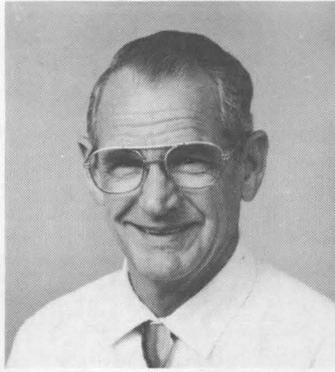
Sept. 3 — Sunday Jazz at the Zoo: Zimbabwe N'Kenya's Jazz Culture and Frank Chewiewie's Latin Jazz All Stars, sponsored by the New Mexico Jazz Workshop; 2 p.m., Rio Grande Zoo, 255-9798 or 843-7413.

Sept. 3 — Arts in the Parks: Horse Feathers, Rick Maisel Magic Show, Miguel Caro and Mexican Fiesta, Linda Cotton and Street Life; 2-5 p.m., Ridgecrest Park (Carlisle & Kathryn SE), 764-1525.

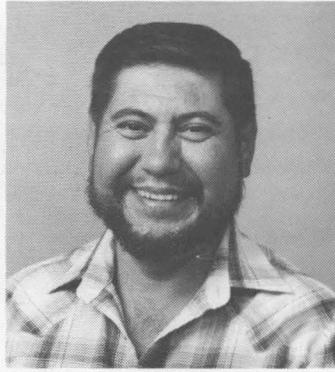
MILEPOSTS

LAB NEWS

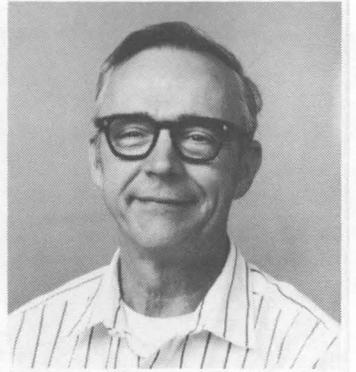
August 1989



Leon Parrish (6257) 30



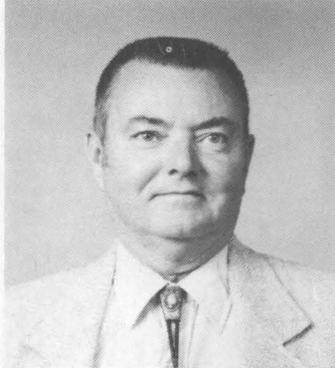
Leroy Tafoya (2314) 15



Richard Guilford (5126) 35



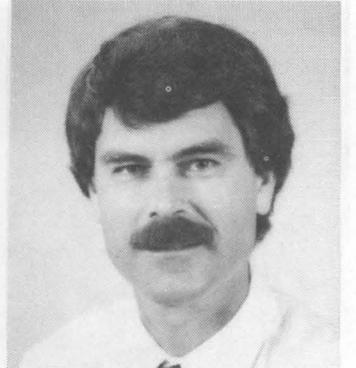
Joe Apodaca (3428) 40



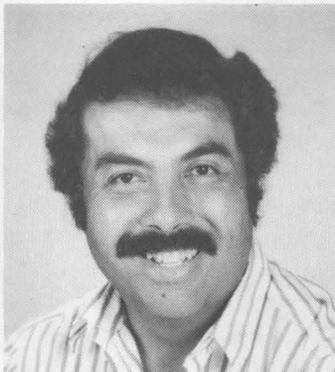
Jay Anderson (3212) 30



Don Cowgill (8343) 15



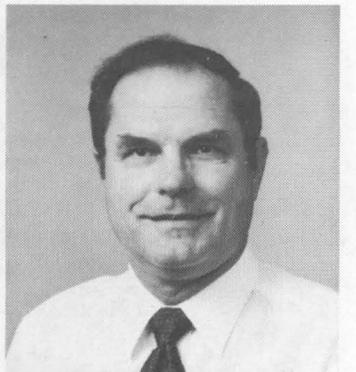
Bill Delameter (8132) 15



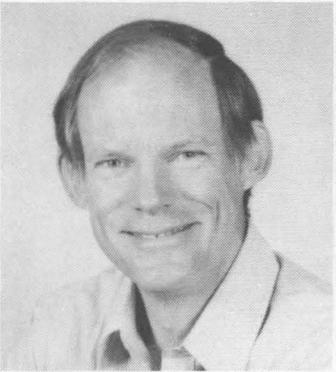
Ray Baldonado (8442) 20



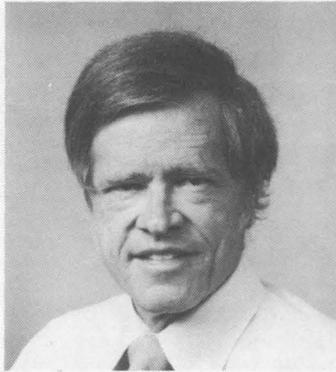
Gary Miller (1512) 20



Robert Klett (DMTS, 6312) 30



Tom Jefferson (DMTS, 8235) 20



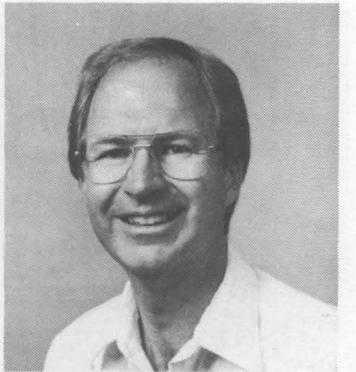
Kenneth Hessel (DMTS, 7234) 20



James Anastasio (2314) 25



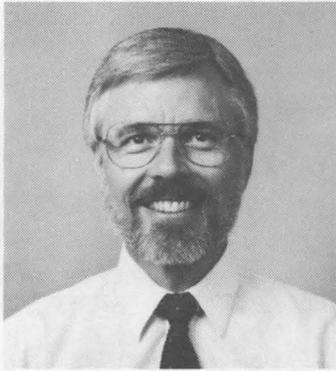
Brian Joseph (6322) 20



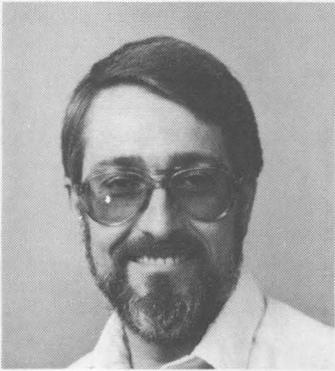
Richard Beegle (2118) 25



Carl Curtis (7525) 30



Ned Keltner (7537) 25



Paul Hatch (1832) 20



Don Bohrer (8160) 30



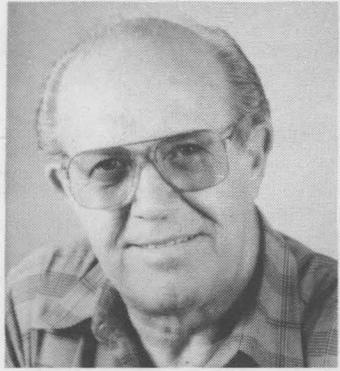
Marlyn Diaz (8511) 15



Les Jones (8451) 30



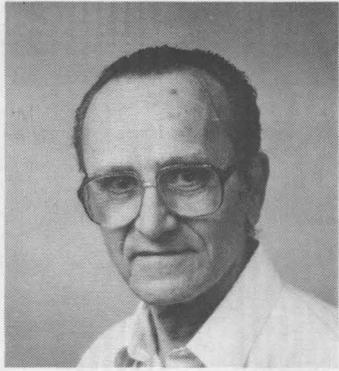
Jerrie Garcia (3423) 15



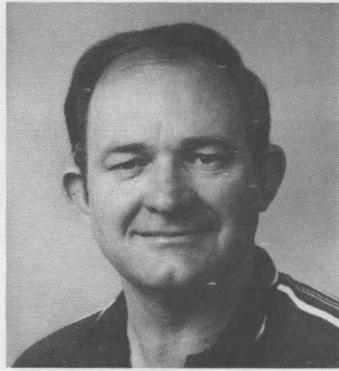
Verne Ivins (8284) 30



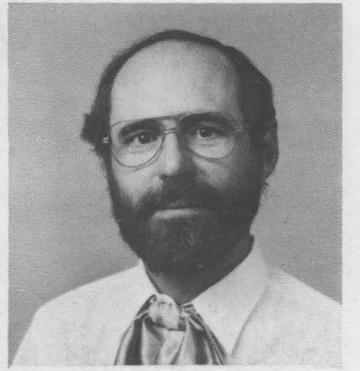
Roy Fitzgerald (5238) 30



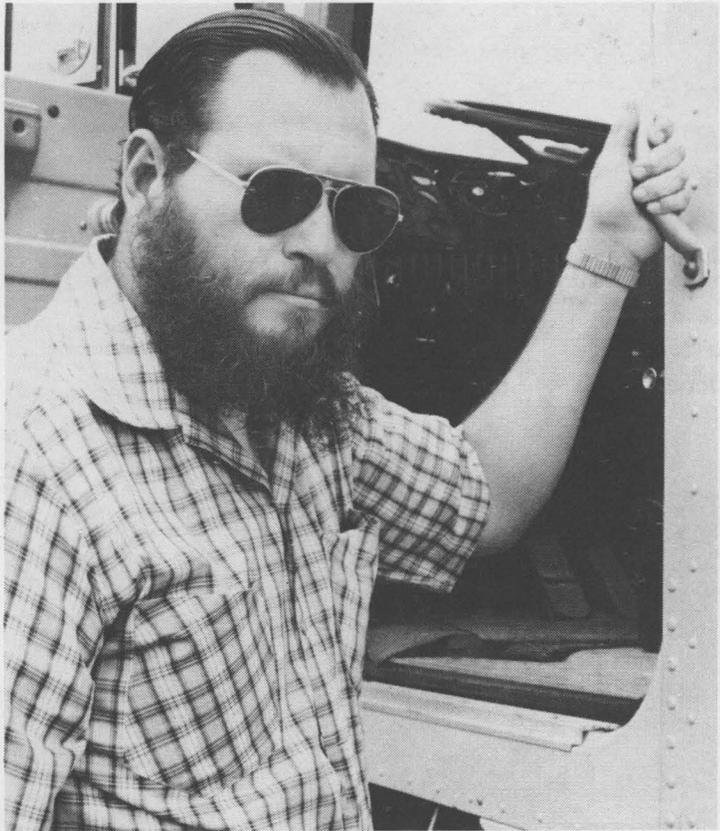
Glenn Norris (7231) 20



Mitchell Ruebush (1235) 20



Bruce Hansche (7551) 20



Martin Armijo (3423)

15



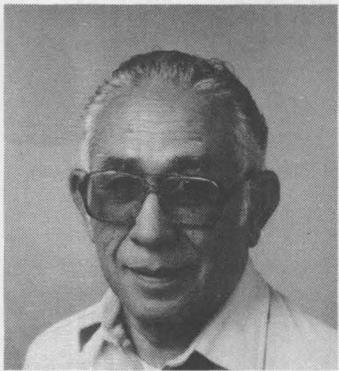
Wayne Sebrell (9111) 30



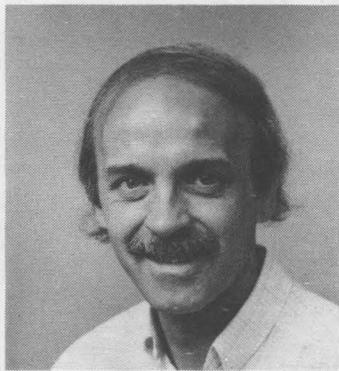
James Renken (2320) 25



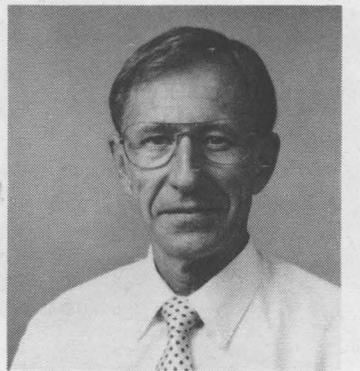
Magdelene Lucero (3431) 20



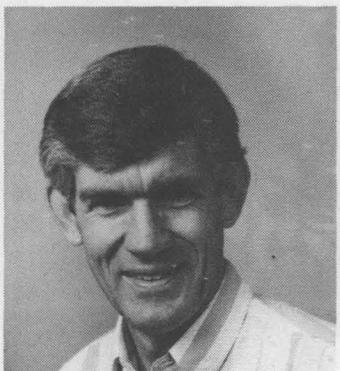
Herman Kaneshiro (7473) 25



Michael Hosking (1833) 15



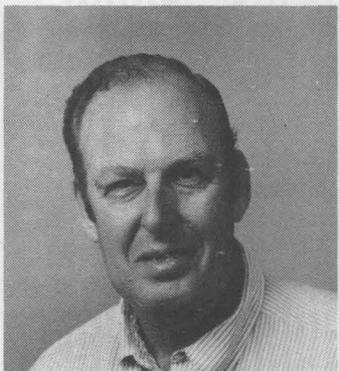
Leslie Anderson (9214) 30



Tommy Guess (7472) 25



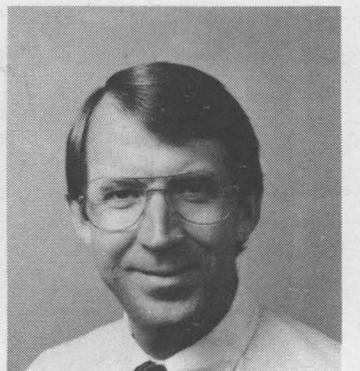
David Barham (5175) 30



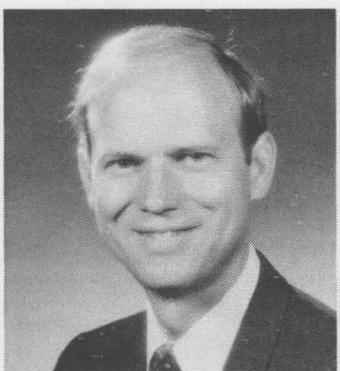
Howard Seltzer (9234) 25



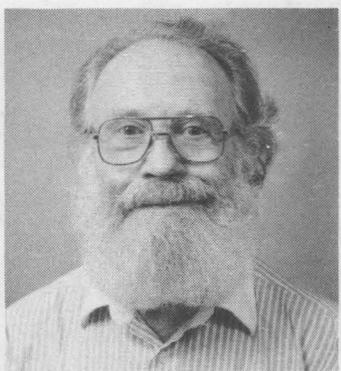
Richard Kavet (5213) 35



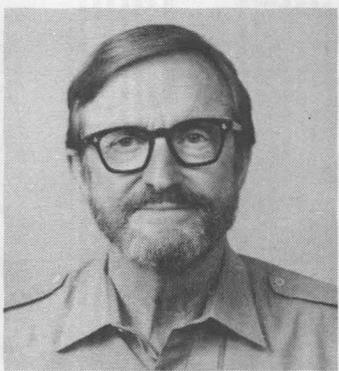
Keith Matzen (1273) 15



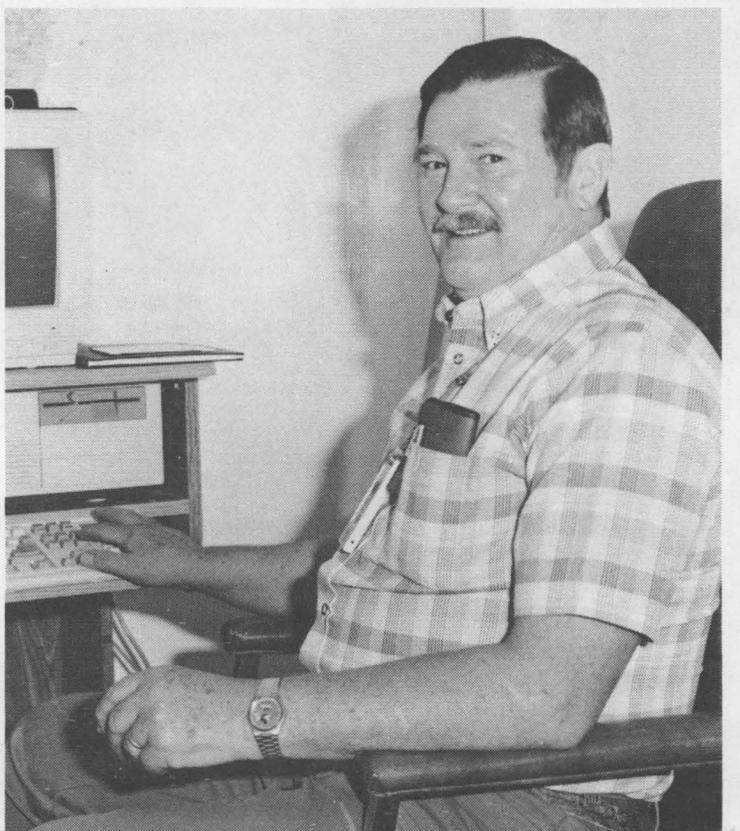
Pace VanDevender (1200) 15



Clyde Babcock (3155) 40



Charles Williams (2344) 35



John Brouillard (7131)

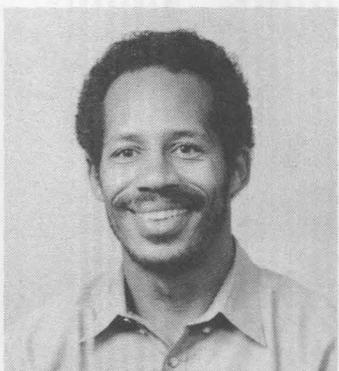
35



Stan Spray (7232) 35



Mike McLaughlin (1200) 35



Ivory Alexander (2648) 15

UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS

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

Ad Rules

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

Early Deadline

Because of the Labor Day holiday, the deadline for ads and other LAB NEWS submissions for the Sept. 8 issue is noon Thursday, Aug. 31.

MISCELLANEOUS

DOUBLE-SIZE MATTRESS AND BOX SPRING, \$100; solid wood doors, 24" x 78", \$20/ea. Pitts, 293-5481.

STOCK TANK, 2' x 4'; man's western hats, boots, jackets; woman's western/English clothing. Siegrist, 293-4148.

METAL CABINET, white, work-area top, w/shelf, drawer, double drawers below, electric cord attachment, 23-1/2" x 45" x 17". Nelson, 865-9516 after 5.

FOUR SHEETS FORMICA 2000X, Corian-type, solid surface, 1/2" x 30" x 96", 80 sq. ft. total, almond color, \$250/sheet. Parker, 294-5618 after 5.

FORD TRACTOR, w/blade, rebuilt w/new main tires, located at Peña Blanca, \$2400. Lysne, 296-5039.

AIRLINE TICKET, one-way Albuquerque to Minneapolis via Chicago, Sept. 5, not changeable, cost \$119, make offer. Hietala, 296-3287.

DESK, 4' x 6', gray, \$50; matching metal chair, \$20; couch and chair, \$40; dog kennel, \$10. Richards, 299-2672 leave message.

UTILITY TRAILER, 1/4" channel frame, 4' x 5' bed. Garcia, 268-3848.

AFRICAN GREY CONGOS, mature male and female (surgically sexed), bonded pair, w/cages, \$445/ea. or \$800/pr. Sargent, 865-3227.

PING-PONG TABLE, w/vinyl cover, accessories, \$75; Body Shop 360 rowing machine plus, \$60 OBO; beanbag chair, \$20. Cooper, 881-1329.

GARAGE SALE: baby clothes (boy's), art, dishes, furniture, Aug. 26, 9 a.m.-3:30 p.m., 435 Wellesley NE (off Lomas near Carlisle). Loudon, 256-3684.

QUEEN-SIZE HEADBOARD AND FRAME, \$50; kitchen table and 4 chairs, \$30; suitcase, \$10. Kelly, 266-2142.

SAMURAI WHEELS, white spokes, new, \$40/set OBO; toddler bicycle seat, \$10. Quintana, 898-6718.

WINDSURFER ROCKET II, w/full rig, \$335 OBO; Madrid long board for windsurfing, \$110 OBO. Blackledge, 294-6030.

CHILD'S FLIP-TOP STUDENT DESK & CHAIR, for child under 8 yrs. old, \$20. Hoffman, 294-4167.

RIDING BOOTS, designed for Trials/Trail/ATV riding, used 4 times, \$125; Wilson "Personal" golf clubs & leather bag, \$185. Pryor, 294-6980.

DOUBLE-SIZE WATER-BED FRAME, new mattress, heater, and controls, \$50. Stuart, 265-7315.

STEREO, Technics SD-D530 rack system, tuner, amplifier, turntable, dual

cassette deck, CD player, 2 SB-2740 speakers, \$995 OBO. Fisher, 298-0526.

STOVE VENTILATOR HOOD, \$50 OBO; electric Hotpoint cook-top stove, \$100 OBO; double electric built-in ovens, self-cleaning, \$350 OBO; all avocado. Case, 293-5466.

PARAKEET AND HAMSTERS, cages included, free. Hesch, 892-2724.

HEATHSTOVE by Sierra, model 1200, heats 1500 sq. ft., \$300. Lackey, 869-9333.

SONY STEREO, AM/FM receiver, fully automatic record player, \$25. Rhoads, 298-6157.

MICROWAVE, 21" Quasar, \$45. Biggs, 265-3036.

CONN PROFESSIONAL TROMBONE, w/case, \$265; student-model trumpet, w/case, \$75. Yio, 265-2205.

KING-SIZE WATER BED, w/liner, mattress, and heater, dark-stained bookcase headboard and frame, \$100. Portman, 293-3524.

SONY CAR STEREO, AM/FM cassette, equalizer, auto reverse, \$75; running boards for Toyota pickup, \$80. Lemmon, 292-3243.

BABY STROLLER, swivel wheels, designer colors, \$75; student desk, Early American, maple finish, \$50. Ray, 294-7720.

STORM DOOR, white, Sears, \$60. Shipley, 298-2433.

OFFICE FURNITURE, pine butcher block, walnut finish: desk, chair, typing table, credenza, bookcase, matching chair and ottoman, \$550. Slosarik, 294-0071.

STUDENT INSTRUMENTS: Artley flute, w/case, \$245; Conn French horn, w/case, \$375. Posey, 292-5363.

GARAGE SALE: fishing, camping, household items, Aug. 26-27, 9 a.m.-3 p.m., 10313 Apache NE. Carpenter, 299-4312.

AIRLINE TICKET, United, one-way, Albuquerque to Denver, Oct. 5, leave at 10:18 a.m., \$50 OBO. Marchi, 291-9681.

ENGLISH SPRINGER SPANIEL PUPPIES, AKC-registered, 28 field champions in last 4 generations, available after weaned, \$150. Woodfin, 281-2702.

COUCH AND CHAIR. Chavez, 298-1649.

FILE CABINET, 2-drawer, \$25; camping equipment: Coleman stove, tent, tarp, stand-alone hammock. Schubeck, 821-3133 weekday evenings only.

TRAVEL TRAILER, '87 Terry Resort, 29', basement model, AC, awning, stereo, more, \$6000. Eilers, 294-8582.

STEREO, w/AM/FM radio, turntable, dual cassette tape drives, \$75. West, 292-7091.

KING-SIZE WATER BED, complete, w/lighted mirrored headboard, padded rails, \$150; brown crushed-velour love seat, \$50. Barker, 892-3513.

VIOLIN, 1/4-size, Nagoya Suzuki, w/bow and case, \$175. Bauer, 266-8480.

OAK CRIB w/mattress, potty chair, stroller, tricycle. Skinner, 281-9851.

MAN'S GOLF SET: 3 woods (1-3-5), 8 irons (2-3-5-6-7-8-9-PW), Permatube bag, cart, \$90. DeReu, 275-2336.

STUDENT VIOLIN, full-size, from Mittenwald, Germany, w/bow and case, \$675. Moss, 298-2643.

NIKON FM CAMERA BODY, Nikor 50mm F1.4 lens, Vivitar 2500 flash, Vivitar 2X extender, close-up lens set, \$365. Rainhart, 821-3690.

KEYBOARD DRAWER, new, \$30; garage door opener, 1/3-hp, \$25. Webb, 828-2271.

SMITH-CORONA XL1000 TYPEWRITER, dual-pitch, auto correct and center, 3 extra printwheels, carrying case, used twice, \$100. Tozzi, 275-3324.

COMPUTER TABLE, w/hutch, \$100. Sena, 299-5727.

AUSSIE SADDLE, \$500; Spanish-style wood file cabinet, \$110; Sears radial saw, \$200; base-station CB, \$85. Stauffer, 344-5714.

BLACK UPRIGHT PIANO, Julius Bauer, 2-1/2 yrs. old, cost \$1654, sell for \$1150; EverLast punching bag, \$55. Padilla, 865-3663.

FRENCH HORN, double Horton F, \$800. Wright, 296-3850.

REMINGTON 12-GAUGE PUMP SHOTGUN, model 870, modified choke, vent rib, \$225. Reinhardt, 881-7883.

BEAGLE, 1 yr. old, w/papers, spayed female, \$125. Costales, 821-6084 after 4.

CRIB AND MATTRESS, \$100 OBO; Nu-line safety gate, \$7. Jojola, 292-7962.

DRAFTING BOARD, 60" x 32" w/42" parallel rule and Borco pad, \$35. Gerwin, 881-0028.

"HEN AND CHICKS" GROUND COVER, drought-resistant, 5¢ ea. Kersch, 821-2848.

MAGNAVOX 19" COLOR TV, \$100; electric space heater, baseboard model, \$50. Mowry, 299-2526.

MUZZLE-LOADER, T/C Hawken, .54-cal., accessories, \$190. Desjarlais, 296-9048.

COMMODORE 128 COMPUTER, two 1571 floppies, color monitor, tape, cables, software, \$650; Mayline drafting table, w/parallel bar, \$150. Jensen, 821-6178.

CELLO, 3/4-size, Pfretzschner, w/bow & case, \$800; canopy bed, white wood frame, \$50; white eyelet canopy, ruffle, \$20; twin-size box spring, \$50. Drotning, 294-4807.

LITTON GO-ANYWHERE MICROWAVE, .7 cu. ft., \$120; Atari 2600 w/cartridges and storage cabinet, \$30. Burstein, 821-6688.

ETHAN ALLEN DINING TABLE & CHAIRS, antique pine, \$400; French doors, \$75. Harris, 299-4559.

SEARS ELECTRIC MIXER, 3 cu. ft., \$230; Sears refrigerator, 16 cu. ft., w/bottom freezer, \$75; 2 swivel rockers, Homestead House, \$75/ea. or \$125/both. Mitchell, 299-5144.

ETHAN ALLEN STEREO CABINET, custom-room-plan, antique pine, 40" x 30" x 19"H, \$150 OBO. Lambert, 293-8825.

ORANGE TABBY CAT, 1-1/2 yrs. old, spayed female, declawed, has shots, free to good home. Wilde, 243-4209.

WEBER KETTLE GRILL, Little Smokey Joe, \$10. Koepf, 294-7136.

TAPPAN COOKTOP, \$30; 92" sofa, \$40; 2 maple platform rockers, \$25/ea.; 2 Samsonite suitcases, \$15/ea. Hinds, 869-2191.

NETHERLAND DWARF MINIATURE RABBITS, various colors, some show quality. Sharp, 243-1498.

MINIATURE SCHNAUZER PUPPIES, AKC-registered, salt and pepper, champion bloodlines, dam and sire on premises, \$250. Gilbertson, 869-3468.

CURIO CABINET, humidifier, brass FP set, wicker hamper, silver/turquoise necklace w/earrings, blender, electric scissors, iron, teapot, love seat. Levan, 344-9794.

ELECTRIC STOVE, 4-burner, Frigidaire, self-cleaning oven, \$100 OBO. Runyan, 255-6719.

REMINGTON .308-CAL. RIFLE, model 788, w/scope, \$250; GE 8-spd. food processor, w/extra blades and cookbook, \$30. Parson, 291-8394.

TRANSPORTATION

'71 VW SUPERBEETLE, \$1000. Arris, 256-0319.

'72 YAMAHA 250 ENDURO, \$250. Garcia, 268-3848.

'84 NISSAN PULSAR, 38K miles, T-top, Yamaha stereo, code alarm, AC, PS, \$500 and assume loan of \$10761. Sanchez, 873-0219.

'88 TOYOTA PICKUP, 4-WD, standard cab and bed, blue w/trim striping, 13K miles, \$10,500 OBO. Suber, 275-1933.

GIRL'S SCHWINN BICYCLE, 20", \$45; boy's bike, 20", \$30. Lyo, 299-6470.

ALL-TERRAIN BICYCLE, Sears Tourney, 10-spd., thumb-operated Shimano shifters, 26x1.5 dual-pressure tires, cost \$135, sell for \$75. Schkade, 292-5126.

'78 DODGE VAN, captain's chairs, queen bed, carpet, icebox, sink, AT, AC, PS, cruise, AM/FM cassette, \$3750. Ortiz, 299-3372.

'76 KAWASAKI STREET BIKE, KZ750, metallic green, 19K miles, \$600 OBO. Mistretta, 839-0240.

REPO: '87 HYUNDAI, 2-dr., 5-spd., 4-cyl., stereo tape deck, 24.1K miles, bids accepted through Aug. 23, we

reserve the right to refuse all bids, subject to prior sale. SLFCU, 293-0500.

'87 CHEV. VAN 20, Regency 7000 Conversion, loaded, front and rear AC, 38K miles, \$18,770 blue book, sell for \$18,500. McEwen, 821-1374 after 5.

'85 PONTIAC GRAND AM, AC, PS, AM/FM cassette, tilt, 2-dr., 5-spd., \$6100. Huerta, 930 Louisiana SE, Apt. 98.

HONDA XL200 DIRT BIKE, w/helmet, \$395; bike trailer, \$135. Blackledge, 294-6030.

'79 CORVETTE, loaded, \$12,500 OBO. Rivera, 821-2828.

BOY'S BICYCLE, 21" Kuwahara Freestyle, Z rims, cost \$300, sell for \$125. Dunlap, 884-0232.

'87 HONDA CRX, 5-spd., AM/FM cassette. Carr, 281-1632.

TWO 10-SPD. BICYCLES, \$25/ea. Kelly, 266-2142.

'86 HONDA XL250R, 2.45K miles, \$950. Swahlan, 292-3598.

'78 PORSCHE 911 SC, red, brown leather interior, 74K miles, AC, recent major service, clutch, tensioners. Freeman, 296-2977.

'78 ALFA ROMEO SPIDER, silver metallic, black interior, 35K adult-driven miles, service records available, \$5000. Moore, 292-2853.

'81 CHEV. CITATION, AT, AC, PS, PB, all maintenance receipts, \$1500. Harrison, 897-0658.

'84 BUICK CENTURY LIMITED, 4-dr., loaded, 59K miles, AM/FM stereo cassette, AC, PS, \$4950 OBO. Knoll, 299-1181.

'84 CHEV. CAPRICE, 4-dr., light blue, PB, PS, AC, power seat, electric door lock, light blue interior, AM/FM cassette. Boeck, 298-6495.

WOMAN'S 10-SPD. BICYCLE, 26", Sears, racing handlebars. Switendick, 255-1003.

'83 HONDA ACCORD, 4-dr., new Michelins, all records, \$4300 w/new \$1000 stereo system or \$3600 w/original system. Kjeldgaard, 268-8835.

'83 CHEV. CAPRICE SW, PS, PB, AC, PL, luggage rack, cruise, tilt, \$4500. Thompson, 292-2877.

'87 ACURA INTEGRA, 3-dr., 5-spd., 14K miles, AC, AM/FM cassette, sunroof, extras, factory warranty to May 1990, \$9300. Henderson, 884-8309.

'74 BRONCO, 302 V-8, 4-WD, AT, roll bar, heavy-duty suspension and rear end, maintenance records, manuals, rear external spare-tire carrier. Skinner, 281-9851.

'77 CHEV. PICKUP, 1/2-ton, 6-cyl., stick shift, needs paint, \$1000. Riley, 293-5868.

'85 HONDA 250 SX ATV, 3-wheeler, new tires, \$795; '82 Honda XL 500R, new tires. Vigil, 296-3590.

'85 CHEV. CONVERSION VAN, 4 captain's chairs, sofa/bed, power, AC, AT, cruise, brown, gold, oak, \$9500 OBO. Stauffer, 344-5714.

'88 MERCURY TOPAZ LTS, 4-dr. sedan, blue and silver, PW, PDL, PDS w/lumbar, AM/FM tape, tilt, cruise, 5-spd., \$7600. Sargent, 865-3227.

'85 NISSAN SENTRA, AT, PS, PB, AC, deluxe package, 48K miles, \$3750. Mader, 292-5038.

'76 HOLIDAY RAMBLER MOTORHOME, new tires, dual exhausts, TV, stereo, 52K miles, \$9500. Revels, 344-3033.

'85 PLYMOUTH VOYAGER LE, fully loaded, below book, \$7350. Kersch, 821-2848.

'87 TRANS AM, metallic silver, fully loaded, T-top, AT, V-8, 24K miles, \$10,500 OBO. Mills, 823-4484.

'86 CHEROKEE LAREDO, 4x4, 2.5L, 20-mpg/city, 32K miles, options, \$12,000. Garcia, 898-2605.

'74 MARK TWAIN TRI-HULL BOAT, 18-1/2", w/'79 Mercury 150-hp outboard, walk-through windshield, AM/FM cassette, \$3500. Shiver, 299-1576 or 298-4418.

'81 YAMAHA 750 VIRAGO MOTORCYCLE, black, clear fairing, saddle bags, new tires, \$1000. Yellowhorse, 892-5604.

'77 BMW 320i, Sierra beige, 86K miles, 4-spd., AC, cruise, sunroof, MXVs, sheepskins, one owner. Phipps, 299-8490.

'71 DODGE CHARGER, V-8, new tires, \$600 OBO. Puissant, 291-8474.

'83 HONDA CB1000C CUSTOM MOTORCYCLE, fairing, AM/FM cassette, CB/intercom, 5 touring/5 commuting gears, 15K miles, \$1935 book, sell for \$1500. Bowman, 883-1657.

'72 F-250 PICKUP, 4x4, rebuilt motor, PS, PB, AC; '73 Firebird Formula 400, 4-spd., collector's car. McPeck, 299-7496.

'80 DODGE MIRADA, AC, PS, PB, AT, AM/FM cassette, \$1595 OBO; '79 Dodge D-50 pickup, AC, AM/FM, 5-spd., \$1500 OBO. Macallister, 821-1659.

12-SPD. BICYCLE, 27", \$40. Koepf, 294-7136.

'73 MAZDA RX2, \$400. Hinds, 869-2191.

'79 MOBILE TRAVELER MMH, 18-1/2", 35K miles, extras, \$9800 OBO. Sharp, 243-1498.

REAL ESTATE

TWO ADJACENT LOTS near Navajo Lake, one block from water, \$7000/ea. or \$13,000/both. Berthoff, 296-7657.

FIVE CLEARED ACRES east of Sandia Mountains, views, power and water available, \$39,500. Fuentes, 294-0444.

2-BDR. MOBILE HOME, '81 Wayside, 2 baths, upgraded, landscaping, skirting, deck, NE Heights park, \$11,900. Rightley, 822-0383.

3-BDR. HOME, 1-3/4 baths, 2-car garage w/separate openers, timed sprinklers, double windows, front and back floodlights, mountain views, no qualifying, \$93,500. Allen, 298-9833.

VICTORIAN HOUSE, 14 rms., 5 baths, garage, storage building, near Old Town, currently a rental, \$125,000. Stauffer, 344-5714.

3-BDR. HOME, 1-3/4 baths, LR, DR, FR w/FP, 2-car garage, landscaped, 1700 sq. ft., Arroyo del Oso area, \$97,000. Geitgey, 821-5827.

4-BDR. FOUR HILLS HOME, 3 yrs. old, 2100 sq. ft., RV access, more, \$146,500. Mader, 292-5038.

3-BDR. NE HEIGHTS HOME, 2 baths, 1900 sq. ft., new carpet, drapes, paint, kitchen w/all built-ins. Costales, 299-0992.

2.75 IRRIGATED ACRES, South El Cerro Loop, utilities available, 3 wells, subdivided, all or part. Simpson, 299-7998.

3-BDR. HOME, Ridgecrest area, 1-3/4 baths, country kitchen, sunroom, hot tub, \$89,900. Willard, 256-0274.

4 ACRES in Peralta, whole or part, will take real estate contract, \$21,000/acre. Valencia, 877-2595.

2/3-BDR. HOME, Northern New Mexico style, Nob Hill area, 1590 sq. ft., landscaping, private courtyard, \$99,700. Harris, 268-7648.

WANTED

EXTENSION LADDER. Hesch, 275-7630.

WEED EATER, electrically powered; two 2-tube fluorescent overhead shop lights. Underhill, 294-5774.

MONITOR for Commodore 64, reasonable. Sanchez, 831-2645.

NEW YORK STATE FLAG, to borrow. Mozley, 884-3453.

UTILITY TRAILER, will consider any bed size up to 4' x 8'. Roady, 299-6084.

SPORTY CAR, economical, reliable, safe, inexpensive, for 6'7" long-legged 15-yr.-old son. van Berkel, 897-2541.

COUPLES OR SINGLES interested in taking square-dance lessons this fall. Sebrell, 821-4227 or 292-5542.

HOUSEMATE to share NE Heights home w/swimming pool, \$225/mo., utilities paid. Smith, 291-9241.

NONWORKING TVs for \$5-\$10. Mowry, 299-2526.

WORK WANTED

RED-CROSS-CERTIFIED BABYSITTER, 12-3/4 yrs. old, experienced, lives near Indian School and Carlisle. Sype, 255-3365.

Coronado Club Activities

Hyper for Hoedowns? Tonight's Your Night

IF YOU'RE LOOKING FOR an honest-to-goodness, down-home country hoedown, hop on over to El Rancho Coronado this evening (and wear a western hat, because it will get you a free drink). Dinner menu choices — served starting at 6 p.m. — include prime rib (\$8.95), crab legs (\$9.95), or fried shrimp (\$8.49). An award-winning country/western dance troupe, the Kuntry Kikkers, will demonstrate skillful sagebrush shuffling in two different shows, and judge a dance contest open to the first 15 couples that sign up. (Get on the list as soon as you arrive.) Contest prizes include a \$50 gift certificate from Hillson's Western Wear, dinner for two at the C-Club, or four tickets to a movie of the winners' choice. Topping it off, those good ol' Isleta Poor Boys strum their specialties between 8 p.m. and midnight. Chow-line reservations recommended (265-6791).

SAY ADIOS TO ANOTHER SEASON of family swim nights next Wednesday (Aug. 30). It's your last chance of the summer to get in the swim after work, and follow up with a picnic served hot off the grill (people-pleasin' food like burgers, chicken, hot dogs, etc.). The pool/patio area stays open until 8 p.m., and regular admission rates apply: pool-pass holders/free, Club members without passes/\$2, and guests/\$3.

T-BIRD CARD SHARKS NEVER SAY ADIOS to all that gaming; they just keep on shuffling and having a great time during those Thursday-morning sessions. The next one — Sept. 7, starting at 10 a.m. — features free goodies and door prizes, along with the usual convivial conversation and card games.

THE ANNUAL MEETING (translate: most important event of the year) comes up Monday, Sept. 11. Members will elect seven Board members; the top four vote-getters serve two-year terms, while the others serve one-year terms. Cast your ballot at the meeting between 4:30 and

6 p.m.; on weekdays (11:30 a.m. to 1 p.m.) from Tuesday, Sept. 5, through Monday, Sept. 11; or Friday night, Sept. 8, from 6 to 8. Current Board members seeking reelection are Ruben Muniz (143), Steve Ross (3437), Charlie Kaspar (ret.), John McAuliffe (3551), Dick Fairbanks (3521), Anna Bachicha (DOE), and Ed Neidel (ret.). Other nominees are Mark Ralph (6225), Don Thalhammer (7532), and Mary Nation (3712).

IF YOU'VE BEEN BITTEN BY THE TRAVEL BUG, the Thunderbirds have come up with a terrific cure for the resulting itch. The T-Birds are starting a travel program, with trips open not only to retirees, but to all C-Club members and their guests. The first two get-away-from-it-all opportunities happen in October: Laughlin, Nev. (Oct. 8-11) and Canyon de Chelly (Oct. 29-30). Get more information in the C-Club lobby or from Bob Butler on 299-5626.

"SO-LONG-TO-SUMMER" SPLASHFEST: The traditional Labor Day close-down-the-pool party gets under way at 11:30 a.m. Monday, Sept. 4. Festivities — including adult volleyball at 3 p.m. and something called the "Sweatshirt Relay Races" at 5 — continue until 6. Enjoy fine food from the BBQ buffet (served from noon until 5 p.m.) and dandy dancing, courtesy of Trio Grande (from 2 until 6). Free admission for members, \$3 for guests.

IT'S PISCINE-PLEASURE TIME next Friday night (Sept. 1), when your dinner entree choices are whole Maine lobster (\$12.95) or the surf-and-turf special (N.Y. steak and garlic shrimp, \$11.95). Dinner includes your choice of rice pilaf or baked potato, steamed vegetables, rolls, and coffee or tea. Following the fine fish fare, enjoy the Big-Band sounds of Roland De Rose and crew from 8 to 11 p.m. Reservations recommended.

EATING LIGHT THESE DAYS? If so, you'll be glad to learn that, starting Sept. 1, you can bypass the main dinner offerings on Friday night and head for the soup and salad bar, where you have two options: the "one-trip" special for \$1.50 a plate, or the "all-you-can-eat" choice for \$3.95.

Welcome

Albuquerque

- Alice Baltz (3155)
- Robert Case (7266)
- James Dedig (2857)
- Rodney Depoy (7265)
- Claire Gallipoli (3745)
- Douglas Leland (2362)
- Deborah Mulligan (3340)
- Kristi Robinson (7842)
- Marilyn Smith (7254)
- Christopher Strome (3213)
- Timothy Wiseley (2857)

Arizona

- David Bello (5144)
- Donovan Hardenbrook (7842)
- Kenneth Minor (1111)
- Keith Ortiz (7544)
- Brian Van Leeuwen (2341)

California

- John Abbott (3213)
- Pang-Chieh Chen (1411)
- Thomas Hendrickson (7123)

Colorado

- Susan Swanback (3532)

Illinois

- Dennis Helmich (7543)
- Kimball Merewether (7553)
- Edward O'Toole (2313)
- Michael Pelock (2853)

Indiana

- David Harding (6322)

Michigan

- Paul Rockett (1273)

Minnesota

- John Shadid (1424)

Missouri

- Roy Holt (2551)
- David Zagar (9243)

New Jersey

- Katherine Hansen (7223)

New Mexico

- Theresa Padilla (22-2)

North Carolina

- Jason Smith (2345)

Oklahoma

- Darell Rogers (7843)

Texas

- Alphonse Flaherty (7841)
- Robert Lewandowski (7476)
- Randy Rosenthal (2334)
- Norman Smith (2146)

Medical Corner

Provident Change of Address

Provident Life & Accident Insurance Company has moved the Phoenix office responsible for processing Sandia's Medical Care Plan claims. Since new forms with the correct address will not be available for a while, please continue using the current form to file claims, but mail them to the following address:

Provident Life & Accident Insurance Co.
1951 West Camelback Road, Suite 400
Phoenix, AZ 85015

Provident also has installed a new 800 telephone line exclusively for Sandians. The number is 1-800-638-6377. The other 800 numbers are still available to Sandians. They are:

- 1-800-237-1870 (if calling from outside Arizona)
- 1-800-847-1678 (if calling from within Arizona)

If It Would Just Add the Whipped Cream



Strawberry growers in California now use giant vacuum cleaners on their fields to get rid of harmful insects. Edgar Show, an entomologist who invented the "Bugvac" vacuum cleaner, says that it enables growers to suck so many noxious insects off the strawberries that they can use less insecticide and preserve the "good" predatory insects that keep harmful species at bay.

New Scientist



RUNNERS FROM SANDIA who participated in the recent La Luz Trail Run include (from left, with their times) Tom McConnell (DMTS, 9285), 2:00:54; Larry Johnson (DMTS, 5147), 2:03:34; Russ Haushalter (7242), 2:02:03; Terry Bisbee (2648), 1:40:20; Bob Nellums (DMTS, 9122), 2:09:03; and Garry Nez (3411), 1:48:47. Not pictured are John Cilke (2644), 1:34:00, Ed Harley (ret.), 3:05:10; Rudy Lewis (2552), 1:54:02; and Paula McKee (3411), 1:49:01. Long-time Sandia runner Larry Johnson says there were probably other Sandians in the event that he didn't know about. The nine-mile route, which requires almost 9/10 mile of elevation gain, begins near Tramway Blvd. and — after some two miles of road running — continues up the seven-mile-long La Luz Trail to Sandia Crest.