

## 'Archimedes' Enables Robot to Program Itself to Assemble Parts

Getting a robot to program itself automatically is not a new concept, but getting one to do so in the complicated area of mechanical assembly had never been done before. Until now.

David Strip (1412) has developed prototype computer software that for the first time enables a robot to "program itself" to assemble mechanical components.

The new software program — called Archimedes — includes routines by which the system "reasons" which steps are necessary to accomplish a given task. In this way, it automatically generates assembly plans and the robotic programs that are needed to carry them out.

Patrick Eicker, head of Sandia's robotics group as manager of the Computer Sciences Department (1410), is enthusiastic about the potential for this kind of program in nuclear weapons, as well as in commercial-production applications.

"Robots are difficult to program, and not many people know how to do it," says Pat. "They need

lots of support because robots just aren't very capable, despite what you might have read."

### A Big Help for US Industry?

"The ability to quickly and cheaply write robot programs — that is, to automatically program them

— will allow the use of robots in the production of small batches, perhaps even one-of-a-kind items," adds Ed Barsis, Director of Computer Sciences and Mathematics 1400.

Dave Strip, who is in the Software Techniques  
(Continued on Page Eight)



DAVID STRIP (1412) places parts in a "parts kit" that a robot (arm shown) picks up and assembles into a strong-link component. The robot uses an assembly plan that's developed by the Archimedes computer program. David and other Sandians in 1410 developed the program that allows a robot to program itself automatically to do mechanical assembly — believed to be the first program that makes this possible.

### Archimedes Robotics Program: What It Does — Automatically

In David Strip's demonstration of the Archimedes computer program, a commercially available robot assembles the parts of a strong-link pattern wheel, as programmed by the computer system.

Using computer vision, the robot determines the locations of the parts, then picks them up one by one and assembles them in their proper positions. Where necessary, it exchanges the manipulators needed by its single mechanical arm to pick up the two different kinds of parts — a pneumatic gripper for picking up the pins or a vacuum gripper for picking up the flat cogs — in the sequence determined by the system. It also follows other special instructions issued automatically by the system — for example, turning the workpiece to permit welding on the underside.

Three special fixtures were also designed automatically by the system and used by the robot in the assembly demonstration.



# LAB NEWS

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### Three-Year Faculty Appointments

## Sandia and Los Alamos Scientists Can Become Part-Time UNM Faculty

Sandia has joined with the University of New Mexico and Los Alamos National Laboratory in a partnership program that will create a new class of three-year faculty appointments for top scientists from the two laboratories.

Announced this week, the UNM-National Laboratories Professorship Program will begin with five appointments, but as many as 20 are expected in the future. The program is made possible by the National Competitiveness Technology Transfer Act of 1989, authored by New Mexico Sen. Pete Domenici. It encourages the labs to do joint research and to exchange personnel, services, and equipment with universities and industries.

Bob Eagan (1800), co-chair of the UNM-Sandia Joint Working Group, says the faculty appointments will extend the "excellent interactions" that have already been established with UNM faculty in areas such as chemistry, chemical engineering, and geology.

### Expect More UNM Collaboration

"This program is but one more example of the cooperative programs that have developed through the UNM-SNL Joint Working Group organized by Dick Schwoebel (2500) and UNM President

Gerald May when he was the dean of the College of Engineering," Bob says. "In this particular case, Hobson Wildenthal, dean of the UNM College of Arts and Sciences, proposed the idea, then developed it with LANL management and the UNM-SNL working group. We are continuing to explore other collaborative programs involving Sandia's technology transfer organization, the UNM School

of Medicine with our materials and component organizations, and UNM's instructional service organization with our education department."

Personnel exchange programs such as this are one of the best ways of fostering institutional interaction, says Venky Narayanamurti, VP of Research 1000: "These professorships will further strengthen our ties with UNM. The education of scientists and engineers is of great importance to the nation's technological future."

An application process should be in place by March 1. Most appointments will be made in mathematics, the physical sciences, and engineering. Scholars and researchers appointed to the new positions will teach one three-credit course a year at UNM and will be given full departmental rights.

The lab professors will spend five to six days a month on campus during teaching semesters and one to two days during non-teaching semesters.

Wildenthal says the increased presence of Sandia and Los Alamos scientists on the university campus will help the two labs in their recruiting and provide more dissertation topics. The program is expected to provide UNM with additional top-quality faculty without conducting formal searches for high-caliber scientists.

### Program Extends Sandia's Support of Education

Sandia makes extensive contributions to education in New Mexico at all levels, including high school. In FY87, the latest year for which statistics are available, Sandia contributed about \$7 million to education in the state. This included expenditures for the education of Sandians at state schools, contracts for research and services, and such programs as instructional TV assistance and adjunct professorships. Also included in this total are equipment/property grants and loans worth about \$1.75 million and temporary employment of students and faculty at a cost of more than \$1 million.



# This & That

**Punster Phyl** — Assistant Editor Phyllis Wilson came up with a doozie of a pun (a “groaner”) as we were preparing the last issue, which featured the Waste Isolation Pilot Plant (WIPP) Project. We use a desktop publishing program called “Quark XPress.” Queried as to my whereabouts during layout of the WIPP stories, Phyl quipped that I was over “Quarking the WIPP.”

\* \* \*

**A Week Later Isn't Soon!** — “Leave a message, and I'll return your call as soon as possible.” That's what you usually hear on office phone-answering machines. How about changing the message to something more appropriate when you're on vacation or an extended business trip, asks Ned Underhill (2601). Like many of us, Ned has left important messages on a machine, only to find out later that the person was gone for days. I think it's pretty easy to update the machine message if you're going to be away for several days. Many Sandians already do that. It would be helpful if more would.

\* \* \*

**Technology Run Amok** — New technology is often wonderful, but it can “getcha.” A recent item in *New Scientist* illustrates why those of us in the modern newspaper business stay nervous: “The newspaper industry has gone through a well-publicised [British spelling] revolution, converting from old-fashioned molten metal to new-fangled computer control. Nowadays, journalists work with a word processor which ‘directly injects’ their text into the computer typesetter. This, no doubt, explains why a serious leader [editorial] in the *Evening Standard* recently started ‘One of the greatest achievements of Mrs. this is a test this is a test this is a test Thatcher . . .’”

The same item told about an editor using the global “search and replace” command to change the word “poll” to “turnout.” All went well until it reached Ms. A. J. Pollack, who became Ms. A. J. “Turnoutack.”

\* \* \*

**Good Advice, But . . .** — Recent advice in *Focus* newspaper, published for Kirtland AFB personnel: If you're going away from home for a few days, “have a neighbor watch your house, shovel snow, pick up the mail and newspapers, and park in your driveway from time to time.” Good advice, I'm sure, but that snow-shoveling business might be a real test of neighborliness.

\* \* \*

**Sobering Statistics** — Alcohol-related crashes brought an estimated economic loss to New Mexicans of \$1.6 billion in the three-year period 1986-88, according to a study released by the State Highway and Transportation Department late last year. The study says this amounts to more than \$3000 per family, on average, for the estimated 538,000 households in the state. Over the three-year period, 913 lives were lost to drunk-driving crashes, 3753 persons suffered incapacitating injuries, and 8372 others suffered lesser injuries.

\* \* \*

**Paul Harvey, I'm Not** — but I do enjoy a good bumper sticker. I spotted a good one a while back on a Sandian's car: “The day my ship comes in, I'll probably be at the airport.”

•LP

## Blood Donors Needed

# Goal for 1990 Is 130 Pints a Month

Nationwide, voluntary donations to community blood supplies have declined over the past several years. Sandia's blood-donor program has followed that trend.

“We've seen our total donations drop from 1932 pints in 1977 — our peak year — to 1234 pints in 1989,” says Linda Stefoin (3543), Labs blood-donor program coordinator. (During that peak year of 1977, Sandia, Albuquerque's, on-roll population was approximately 6300, almost 1000 less than the 7288 on roll at the end of 1989.)

Even more worrisome, says Linda, is the fact that blood donations at Sandia averaged just 87 per month during the last six months of 1989, down from a much higher number earlier in the year.

Linda says the AIDS scare may have contributed to the decline — unnecessarily, since there's no chance of contracting AIDS or any other infectious disease during the donation process. All materials used — swabs, needles, blood bags, and so on — are sterile and are used only once.

“January is National Blood Donor Month,” says Linda, “so this is an appropriate time to reverse our decline in blood donations. In fact, the Sandia goal for 1990 is 130 pints a month, so our work is cut out for us.”

An estimated 90 percent of US citizens will need blood or blood products sometime during their lifetimes, according to Gretchen Cody, who's Kirtland AFB donor resource specialist at United Blood Services. “However,” says Gretchen, “just five percent of US citizens donate. We'd like to see more people share the load.”

At Sandia, Albuquerque, individual donors in 1989 numbered about 400, slightly more than the five-percent national average. However, only about 200 Sandians are “regulars” who donate every eight weeks — the time required between donations — reports Linda.

“We'd like to see that ‘hard-core’ group double, or even triple, in size,” she says. “And we'd like to see a return of people who've donated in the past, but simply got out of the habit. An increase in first-time donors would also help us reach our goal.”

“We appreciate the loyalty and personal commitment of Sandia blood donors,” says Gretchen, “and we need their continuing support and participation.”

Your opportunity for giving “the gift of life” occurs every Tuesday — blood-drive day at Sandia, Albuquerque — from 8 a.m. until noon in Bldg. T-13 (just south of Bldgs. 831 and 832). •

## LAB NEWS

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NM CONGRESSMAN STEVE SCHIFF (center) was briefed Dec. 20 on the Labs' educational outreach program by Mike Wartell (9001, left) and Executive VP Lee Bray. After the briefing, Rep. Schiff spoke to Sandians during a colloquium in the Tech Transfer Center. He discussed US troops' entry into Panama (which had occurred earlier that day), events in Europe, and how the Labs might fit into the changing national and international environment.



**Livermore 'State of the Lab' Message****FY90 Budget Situation Requires Adjustments, But No Major Disruption to Lab, Says Crawford**

"We will have to back off from some programmatic goals, but we are in a relatively stable position and well postured for fiscal year 1990."

That was the basic message delivered to Sandia, Livermore, employees by VP John Crawford (8000) during his "State of the Laboratory" message on Dec. 21. Budget difficulties, he said, can be accommodated with no major disruption to Sandia's work.

The weapon program budget — \$105 million — remains the major funding source during FY90 at Livermore.

**Weapons' Role Changing**

"The role of nuclear weapons in the world is changing," John acknowledged. "We predict a downward trend in weapon programs, but I don't believe that the nation will give up the deterrent value of nuclear weapons."

He emphasized the need to modernize the existing stockpile and to keep it "as reliable, safe, and secure as we know how. We must also maintain the credibility of the technology that's behind the stockpile."

President Al Narath's "State of the Labs" message for all of Sandia will be featured in an upcoming issue of the LAB NEWS.



VP JOHN CRAWFORD (8000) delivers his "State of the Laboratory" address to Livermore Sandians on Dec. 21.

John said the unpredictability that exists in the nuclear weapon complex today puts added emphasis on tailoring the strategic stockpile to the nation's needs: "I think Sandia will have an important voice . . . in deciding exactly what is needed in a smaller stockpile. The name of the game will be to get the maximum amount of deterrence out of a smaller stockpile."

**Quality Ethic**

John emphasized Sandia's "quality ethic." "We must do our jobs with minimum resources," he said, "but never sacrifice the quality of the product, whether it be hardware or technological

possibilities." He reminded employees that the (Labs-wide) quality initiative is a long-term commitment, which he described as "a journey, rather than a destination."

Livermore's energy programs have an FY90 budget of \$18 million, John said. A proposed new program would continue the Combustion Research Facility (CRF) addition (sometimes called "CRF Phase 2") with a new mission and new name — the Combustion Dynamics Laboratory. The program would include a partnership with Lawrence Berkeley Lab (LBL) in combustion dynamics. It would link lab facilities at Sandia, Livermore, with LBL's synchrotron light source and a new free-electron laser. Program plans include substantially increasing computational support for this work.

Environmental technology and global climatic change represent new energy research prospects, said John, and projects in reactor repair and hypersonic propulsion diagnostics are being vigorously pursued. The latter program involves a partnership with industry. John predicts that partnerships with industry, universities, and other national labs will be an increasingly common theme as Sandia seeks to form mutually beneficial alliances.

**Reimbursables Growing**

Reimbursable projects — the newest major work area at Livermore — will total about \$19 million in FY90, John reported. The Strategic Defense Initiative Organization (SDIO) funds one of the largest efforts — in experimental space vehicles; this work is done in cooperation with colleagues from Sandia, Albuquerque. Work in another reimbursable project area — liquid propellant guns (a combustible liquid may replace conventional powder charges for some large military guns in the future) — exploits research and diagnostic techniques developed at the CRF.

**New Priorities**

The increasing emphasis on environmental safety and health (ES&H) issues at all DOE facilities is definitely impacting Sandia, Livermore, John

**"The priorities have changed dramatically — number one is to run our business in an environmentally sound manner . . ."**

said. ES&H Dept. 8540, under Dick Rohde, will have two divisions: Health & Safety 8541, continuing under Bill Ormond, and Environmental Protection 8542, with Don Nissen as acting supervisor.

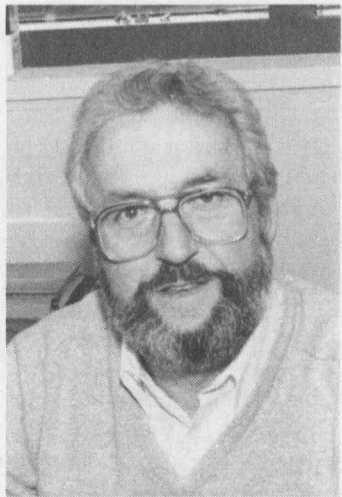
"The priorities have changed dramatically — number one is to run our business in an environmentally sound manner, and this comes directly from Secretary of Energy [James] Watkins," said John. "It's a long-term commitment, and we're giving it the technical and administrative support

*(Continued on Page Nine)*

**SANDIA LIVERMORE NEWS****Supervisory Appointments**

**BILL WOLFER** to supervisor of Theoretical Div. 8341.

Bill joined Sandia at Livermore in March 1985. He has conducted theoretical research in such areas as helium-bubble formation in solids, aging effects in metal hydrides, and tritium radiochemistry. He also initiated a research project on rapid solidification, and more recently became involved in the Savannah River Reactor project.



**BILL WOLFER (8341)**

Before joining Sandia, he was a professor of nuclear engineering at the University of Wisconsin, and for eight years did research on radiation effects in solids and on fusion technology. Before joining the university, Bill was with Oak Ridge National Lab for two years, working in the Metals and Ceramics Division. From 1970-74 he was an engineer with the Westinghouse Advanced Reactor Division and was involved in the design of the Fast Flux Test Facility.

Bill earned a physics degree from the University of Stuttgart and did research for two years at the Max Planck Institute for Metal Research. He came to the US in 1966 to continue graduate study at the University of Florida, receiving his PhD in

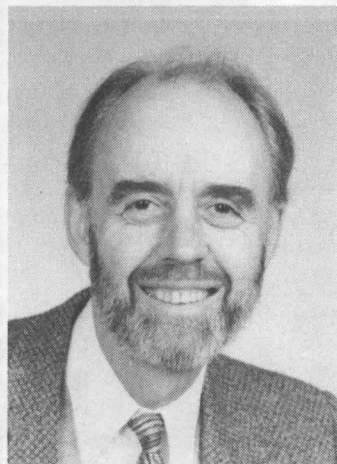
nuclear engineering sciences.

He, his wife Linda, and son live in Pleasanton. Bill enjoys the piano, abstract painting, hiking, and cycling. He is a member of the American Physical Society.

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**BOB MAY** to supervisor of Facilities Engineering Div. 8512.

Bob joined Sandia at Livermore in 1959 as a test-project engineer, but left a year later. In 1961, he rejoined the Labs at Albuquerque in the same field. Bob moved to the Solid Dynamics Research Department in 1966 to do shock-wave studies. He has worked in Livermore's Plant Engineering Department since transferring to Livermore as a facilities designer in 1974.



**BOB MAY (8512)**

School at what was then Sandia Base in Albuquerque.

Bob enjoys square dancing, speed walking, and San Francisco cuisine. He and his wife Jeri live in Danville.



**'Conservative Posture . . . to Protect Employees'**

# Sandia's Asbestos Management Program Will Do More Than Required by Current Laws

Most Sandians probably know that, for some years, there has been a lot of concern about asbestos in schools and other buildings — such as the New Mexico state capitol, where an expensive asbestos-removal project is in progress. Many are also aware that there's been recent activity around Sandia related to asbestos. So just what is Sandia doing about asbestos?

"Basically," answers Nestor Ortiz, Director of Environment, Safety, and Health 3200, "we're checking for asbestos-containing material in buildings and either removing it or otherwise making the buildings safe for occupants."

In a few cases, that has meant temporarily relocating building occupants because of the possibility of asbestos fibers getting into the air. Brian

**"There have been no [airborne-asbestos] values reaching the OSHA threshold."**

Kelly, of Industrial Hygiene/Toxicology Div. 3211, explains: "I've been making measurements of airborne concentrations since 1986. There have been no values reaching the OSHA [US Occupational Safety and Health Administration] threshold, but we have found some cases where there is the potential for asbestos-containing material to be dislodged and release fibers. So the occupants were moved out, not because of immediate risk, but to make sure that they weren't put at risk."

### No Emergency

"Sandia doesn't have an asbestos emergency," says Nestor. "However, we're taking a conservative posture, one that Sandia's management believes prudent to protect employees. It's also the approach AT&T is taking."

"In dealing with the asbestos that was installed in buildings before the hazards were recognized," Nestor continues, "we're generally following the guidelines of the Asbestos Hazard and Emergency Response Act [AHERA], which applies specifically to schools. We're also maintaining strict compliance with applicable OSHA and Environ-

mental Protection Agency regulations."

AHERA imposes strict regulations on the identification, handling, and removal of asbestos in

### 'We're Not Going to Put Anyone at Risk'

Nestor Ortiz, Director of Environment, Safety, and Health 3200, and Ward Hunnicutt, Director of Facilities 7800, stress that the proper steps are being taken to deal with asbestos:

"Sandia is moving aggressively with the Asbestos Management Program," says Nestor. "Friable asbestos-containing material — which means the material could be crumbled by hand and release fibers into the air — is the immediate concern. Building surveys for asbestos, conducted by a qualified contractor, are under way, and employees are being informed of results soon after we review the contractor's report on each building. When we find a situation that has the potential to endanger health, we're taking immediate action."

"We'll notify everyone before significant projects involving asbestos in their buildings," says Ward. "At all times, we'll ensure that proper handling safeguards are in place whenever asbestos-containing material is removed or otherwise has to be disturbed. No one at Sandia is at risk now, and we're not going to put anyone at risk."

schools — any exposed, friable (easily crumbled) asbestos in building materials must be removed, or repaired and properly maintained. By applying AHERA to the Labs' buildings, Sandia is doing more than required by current law.

At Sandia, Livermore, asbestos surveys are complete and removal has begun, says Don Patri- cian of Health and Safety Div. 8541. "We surveyed all the buildings between December 1988 and April 1989," explains Don. "Last month we finished the first phase of removal. That included removing asbestos from equipment rooms, where maintenance people have to go in and out, or might

have to deal with an emergency involving a pipe that had been insulated with asbestos.

"We also removed asbestos from some pipes on the roof of Bldg. 913," Don continues, "so that the building could be re-roofed. And we removed

**In the first phase of the Asbestos Management Program, a qualified contractor is checking Sandia's buildings for friable asbestos.**

the asbestos from several buildings to get them ready for demolition — that included the old steam plant, which was the biggest removal job, and some buildings that were on land we've bought. In the next phase, we'll be taking care of the rest of the asbestos-containing material that was identified. We hope to finish that this fiscal year, but some of the work may extend into next year."

### Asbestos Management

ES&H 3200 and Facilities 7800 are sharing responsibility for the Asbestos Management Program in Albuquerque. The program has been taking shape since last summer. Two of those working on it are Brian Kelly and Ron Eimer (3211). The Asbestos Program Manager is Jerry Hands (7851).

"We're forming a management team that includes representatives from key organizations," says Jerry. "ES&H representatives will be in-house technical consultants, and we'll also contract with experienced, certified consultants in asbestos removal. People from the Facilities organization — including me — will be responsible for overall program management, arranging for building surveys, developing or reviewing specifications for asbestos-removal projects, developing a program for making safe any asbestos that we leave in place, and so on. Other groups that are involved include the Medical, Purchasing, and

**Sandians shouldn't try to take samples of suspect material — they might dislodge asbestos fibers and release them into the air.**

Security organizations. We plan for qualified contractors to do necessary removal work, and their representatives will be part of our team also."

"The first phase of the program," says Ron, "is to survey facilities for asbestos-containing materials and to train employees who work in the buildings where there is asbestos. Most will attend a two-hour course in general awareness about asbestos. For custodial and maintenance employees, we plan a four-hour course — they need to know more, so that they can recognize material that might contain asbestos and will know what to do if they inadvertently come into contact with friable asbestos-containing material."

### Looking and Sampling

During each building survey, a qualified contractor looks for friable asbestos-containing material. The inspector may take samples of suspect material — while following special procedures to minimize disturbance of the material so fibers don't get into the air. Also checked during the surveys are the accessibility of asbestos-containing areas and the potential for the asbestos being disturbed.

All surveys should be completed by October  
(Continued on Next Page)

### More and More Limits on Use

## The Good and Bad of Asbestos

Asbestos is a commercial term, not a mineralogical one, and can apply to any of six chemically and physically different minerals — all of which, however, are types of crystalline hydrated silicates that exist in the form of fibers. An individual fiber is typically much smaller than a human hair and is usually invisible without magnification.

Until the 1970s, asbestos was frequently used for insulation and fireproofing in buildings. The Environmental Protection Agency listed it as a hazardous air pollutant in 1973. Its use in construction was gradually restricted through the '70s. Buildings constructed since about 1978 are not likely to contain asbestos as insulation or fireproofing, although some might have it in materials such as roofing or floor tiles.

Asbestos has useful properties. It's strong, flexible, and durable; it resists acid and heat. Consequently, its use has continued in many products — for instance, in thermal and electrical insulation, gaskets and packing, cement pipes, flooring and roofing products, paper,

plastics, and textiles.

The use of asbestos in construction was limited because of its health hazards. Though safe when contained inside material that's in good condition, asbestos fibers released into the air — by disturbance or wearing away — can remain suspended in the air for several hours and thus can be breathed in. Inhaled asbestos is associated with lung and other cancers, and with asbestosis, a chronic, irreversible lung inflammation that can lead to heart failure. In general, the more fibers inhaled, the more likely that an asbestos-related disease will occur.

Because of the health problems, most remaining uses of asbestos will be stopped in the US by an Environmental Protection Agency rule put into effect last July. That rule phases out the manufacture, processing, importation, and commercial distribution of asbestos-containing products (a few specific products are exempted). The rule sets up a schedule under which the ban gradually takes effect through 1997.



## Asbestos Terms

Following are more-complete descriptions of three key terms used in the stories:

**Asbestos-Containing Material (ACM)** — Under current federal EPA regulations, any material containing more than 1 percent asbestos is considered ACM and must be handled with special precautions. OSHA sets a lower percentage, 0.1 percent, as do some states.

**Asbestos Fiber** — Asbestos particle with parallel sides and length-to-diameter ratio of at least 3 to 1.

**Operation and Maintenance (O&M) Program** — A program to minimize exposure of building occupants to asbestos fibers. An O&M program typically includes work practices to maintain ACM in good condition, ensure proper cleanup of asbestos fibers previously released, prevent further release of asbestos fibers, and monitor the condition of the ACM.



LOOKING OVER Sandia's Asbestos Management Plan and discussing agendas for training Sandians about asbestos are (from left) Jerry Hands (7851), Ron Eimer, and Brian Kelly (both 3211).

### (Continued from Preceding Page)

1991, and probably several months earlier, says Brian. He warns Sandians not to try to take samples on their own, because doing that without the proper training and procedures could disturb asbestos-containing material and release fibers into the air.

For each building that proves to have asbestos, there are three options for action: (1) removing asbestos by systematically stripping away asbestos-containing material and replacing it with non-asbestos material; (2) encapsulation, or coating the asbestos-containing material with a sealant to prevent the release of fibers; and (3) enclosing areas that have asbestos — for instance, overhead

spaces — so that asbestos fibers are contained in limited, unoccupied spaces. A fourth option — to defer action and institute an operation-and-maintenance program (see "Asbestos Terms") — would eventually lead to one of the first three.

"The trouble with any of the options but removal," says Jerry, "is that they only postpone the inevitable. Even if we encapsulate or enclose asbestos, it will have to come out when the building is eventually demolished. So, other things being equal, our preference will be removal."

Similarly, says Don Patrician, the preference for the remaining asbestos at Sandia, Livermore, is to remove rather than maintain it.

Removal of asbestos-containing materials from a building is a rigorous process. The job

starts with creation of a containment area in which the air pressure is lower than outside, to prevent asbestos fibers from escaping. Trained workers wear protective clothing and respirators to remove the asbestos, which must be put into suitable containers and placed in a landfill certified for asbestos disposal.

During the removal process, occupants of an affected work area are relocated and are not moved back until the area is certified safe.

"The program will be going on for several years," Ron says. "The key is to approach it by priorities, using a risk-assessment algorithm to determine what's most urgent. Then we can take the appropriate action." ●CS

## Feed Back

*Q. People in my department — and in many others, I'm sure — regularly discard or send to Reclamation old or unused copies of PC software packages. Why doesn't the Small Computer Support Center sponsor a software-exchange day to reapply this software to better use? Advance notice would allow people to mail in their unused software, even if they can't attend. Finally, Property Reapplication should plan to pick up all leftovers at the end of the day.*

A. The Small Computer Support Center will start a program to collect software packages no longer required by users. The method used to disseminate these "obsolete software packages" will be dependent on the volume and quality of the software received. If the volume is sufficiently large, and the software is in general use at Sandia, a software-exchange fair will be held. An attempt will be made to reintroduce all software packages in a cost-effective manner. Thanks for your suggestion.

Larry Bertholf — 2600

*Q. In the past, my supervisor informed me of my salary for the coming year sometime in early September. It's now almost the last week of September, and my new department manager has yet to release the information.*

Just as the Labs requires funding information for fiscal planning, so do I for establishing my family's budget for the coming year. Is there a policy on disseminating raise information?

A. [Note: Questioner received a personal answer to this question several months ago, soon after submitting it.] When the final compensation-

increase package is approved by Sandia's Board of Directors and DOE is notified, individual notification sheets are sent to the VP offices. This usually takes place in early September (Sept. 5 in 1989). It is then the responsibility of supervisors to ensure the data on the sheets are correct and to communicate increases to employees by Oct. 1. The communication should take place at a separate meeting with each employee.

Ralph Bonner — 3500

*Q. In the past, Sandia provided "community" bicycles to help employees get around Tech Area I. The electric and gas carts now used for this purpose are more expensive to buy, maintain, and operate — and quantities are limited. In the interests of efficiency (employees spend quite a bit of valuable work time walking around the area), wouldn't it make sense to make bikes available again?*

A. At one time, we did own and maintain a "fleet" of bicycles for use within and around Tech Area I. Our experience was quite poor. To assure they were safe, we established a system for inspection and maintenance. Even with that effort, we had a few user accidents and injuries. Also, to assure that bicycles were properly distributed for use throughout the tech area, we had to periodically collect and redistribute them. They tended to "bunch" at the more heavily used gates and, thus, were consistently unavailable at many area sites. Our decision against reintroducing Sandia-furnished bicycles is based on that past experience.

Tim Martin — 3400

### Congratulations

To Debbie (3731) and Jose Luna, a daughter, Kimberly Renee, Nov. 5.

To Lupe (2632) and Jerry Massoth, a daughter, Coral Grace, Nov. 25.

To Daisy (DOE) and Gary Nez (3411), a son, Roderick Andre, Dec. 17.

To Kathy and John (3154) Heald, a son, Austin Taylor, Jan. 2.

### Welcome

*Albuquerque* — Berlinda Baca (2543), Jacolyn Blackburn (22-2), Julie Bouchard (2315), Bruce Bower (7845), Sue Cantrell (3714), Donald Dietz (7212), Reeta Garber (3151), Deanna Garcia (22-2), Elaine Lieberman (21-1), Christopher Madigan (3151), Dorothy McCoy (3426), Charles Meyers (3726), Russell Mickey (3426), Cheryl Mitchell (21-1), Nancy Nicolary (21-1), Donna Ridenour-Booth (3426), Jennifer Taylor (22-2), Suzanne Visor (3426); *Other New Mexico* — Danny Garcia (3426).

*Elsewhere: Arizona* — Kevin Henderson (9127), Mial Warren (2531); *California* — Huei Fang (1533); *Illinois* — Vincent Amatucci (1554); *Texas* — Matthew Blain (2131), George James III (7543).

### But Where Are the "Three-Spined Sticklebacks"?

College mascots include more than bulldogs, says *National Wildlife* magazine. Among those cited: the Emory & Henry College Wasps, the Texas Christian Horned Frogs, and the Campbell University Camels. Not to be forgotten: the Banana Slugs of the University of California, Santa Cruz.

Lynn Asinof, *Wall Street Journal*



## Glass Shop Never Runs Out of Work

If Glass Formulation and Fabrication Sec. 7476-3 specializes in anything, it's one-time, one-of-a-kind, quick-response jobs. But it would be more accurate to describe the organization as many things to many people.

"We do glass melts using raw chemicals, such as oxides and carbonates, to produce unique new glasses," says supervisor Ron Snidow. "We determine physical properties, such as thermal expansion, annealing temperature, softening point, and crystallizing temperature, with dilatometers and differential thermal analysis equipment.

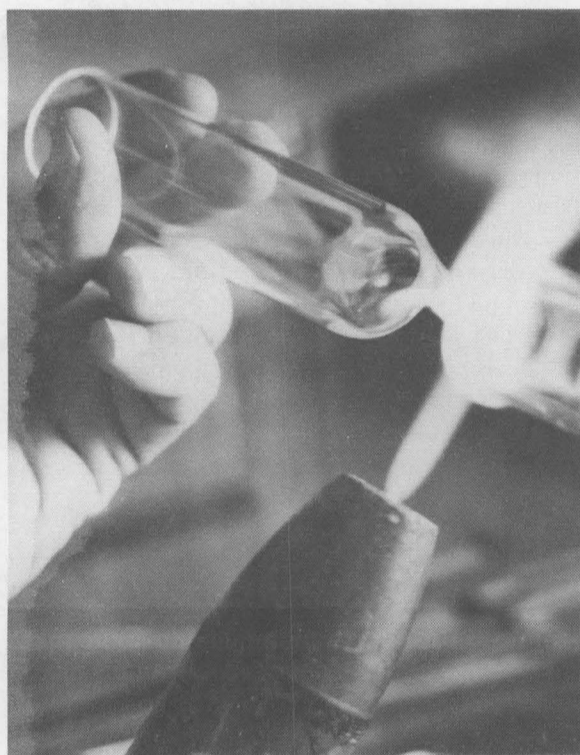
"Our process-development activities," Ron continues, "incorporate new glasses and glass-ceramics into actuators, detonators, headers, and connectors. Glass-blowing activities — using pyrex, quartz, and glass-to-metal seals — produce a variety of glass apparatuses. Supporting our operations, we have a dedicated machine shop and a CAD

[computer-aided design] station."

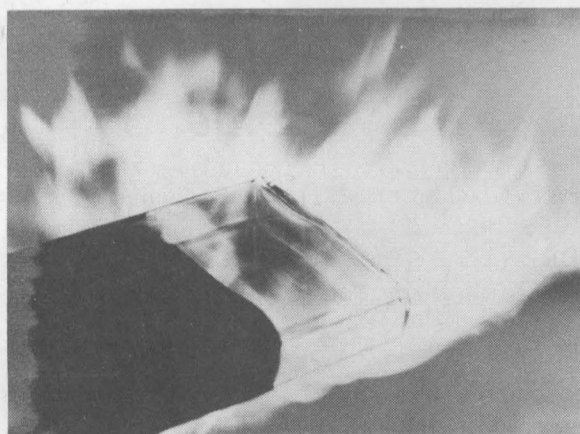
Ron estimates that the people in his section do about 500 melts a year — at temperatures up to 1710°C with platinum crucibles and stirrers — to produce glasses of compositions not otherwise available. In addition, they fill about 700 orders a year to create specialized glass apparatuses for some 25 Sandia departments.

"For a typical 'short order,' somebody will walk in, and together we'll sketch up what's needed," says Ron. "That's how we get orders for most of the fabrication work. Our products include chemical and electrical apparatuses, equipment for physical metallurgy, x-ray tubes, all kinds of things. There are 16 people working in the glass lab, and we stay busy."

Photos (by Randy Montoya, 3162) show members of Section 7476-3.



GLASS TUBING gets a new shape in the hands of Don Oatley.



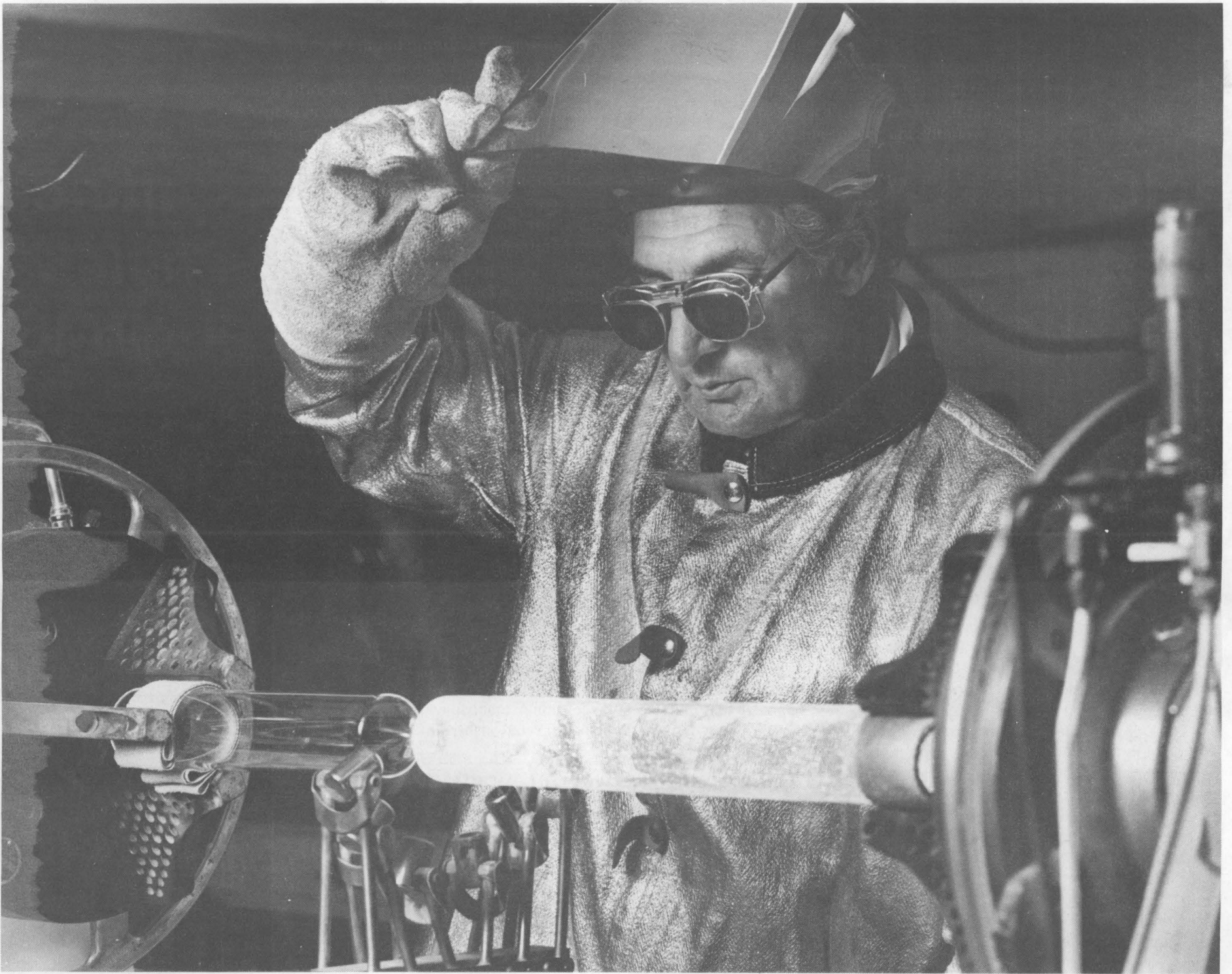
RECTANGULAR PYREX TUBE being given a flat bottom to turn it into a dipping tank. Black area is carbon deposited from the burner.



CLINT TUTHILL makes one of 24 recovery traps — each required to align perfectly with the others — destined for use in removing hydrocarbons from a vapor stream.

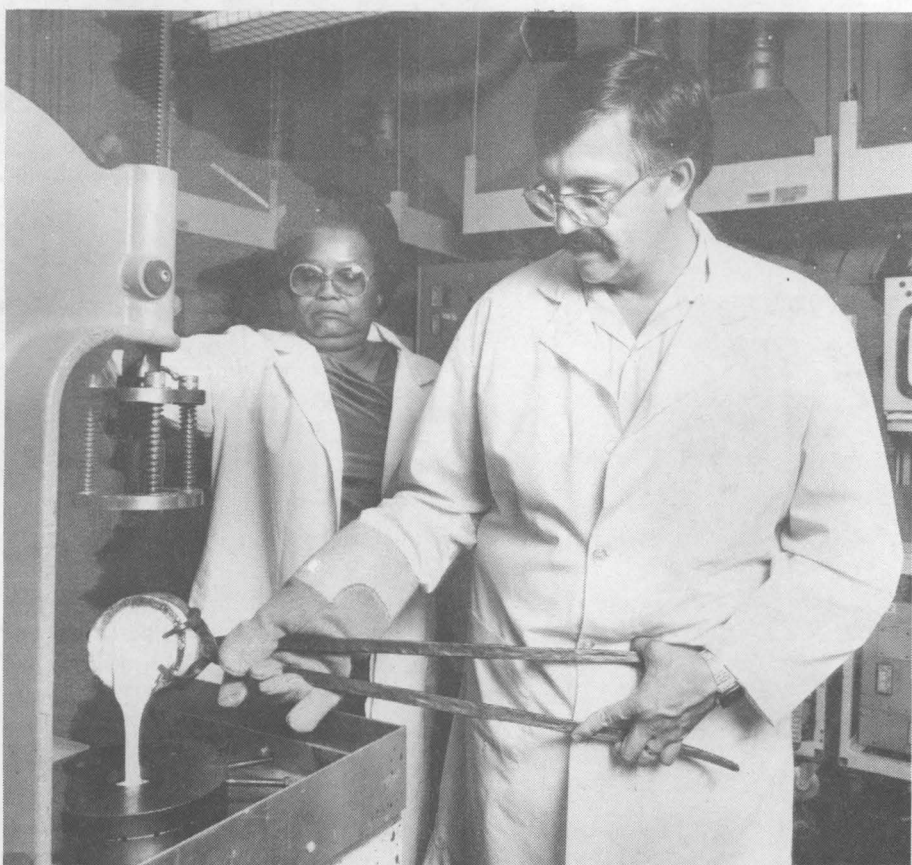






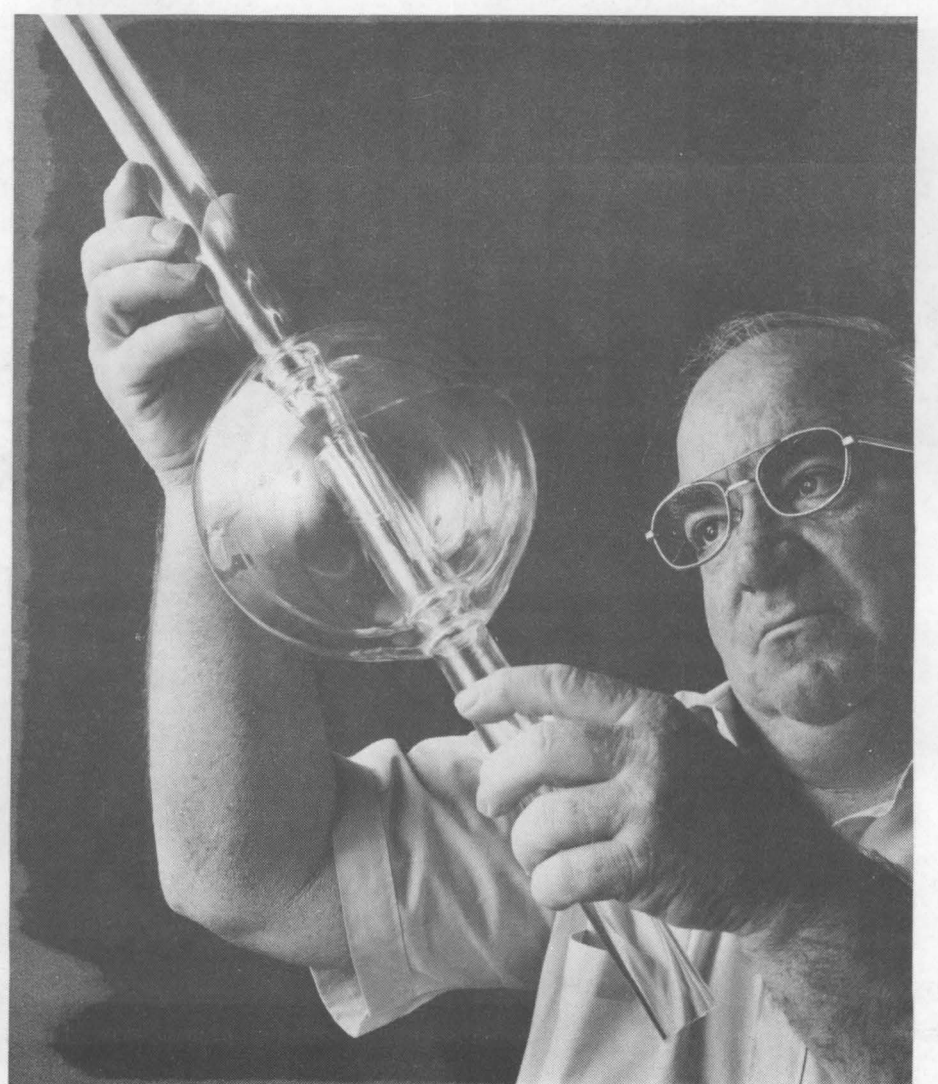
PAT FARINA rounds the bottom of a high-temperature quartz furnace tube into a test-tube shape. Pat wears protective gear because of the heat radi-

ated from the 1500°C quartz glass — enough infrared to cause the equivalent of a sunburn.



ABOVE: TED MONTOYA pours molten S-glass at 1600°C into a mold, as Mary Green stands ready to actuate a press that will force the glass through cavities in the mold and create extruded forms.

RIGHT: RON SNIDOW checks a water-cooled chemical vaporizer for an aerosol system. The vaporizer includes a globe within a globe.





(Continued from Page One)

## Revolutionary Robotics

Division of the Computer Sciences Department, designed Archimedes for use in the US nuclear weapon production complex. But it is believed to have far-reaching implications for design and manufacturing for US industry in general.

"Robots work well in mass-production situations such as painting or welding in the automobile

**"This [program] has the potential for a profound effect, not just on the weapon production complex, but on manufacturing in general."**

assembly line, where a single task can keep a robot busy for months or years," explains Dave. "However, robotic workcells are often too costly to set up and program for the small batches we see in the weapon production complex.

"By automating the setup and programming of robotic workcells, we open new territory for the economical use of robots. This has the potential for a profound effect, not just on the weapon production complex, but on manufacturing in general."

Dave again refers to the automobile industry as an example of current practice: "If a new car comes along, it's a big deal. The whole robot system has to be manually reprogrammed and reconfigured from the ground up."

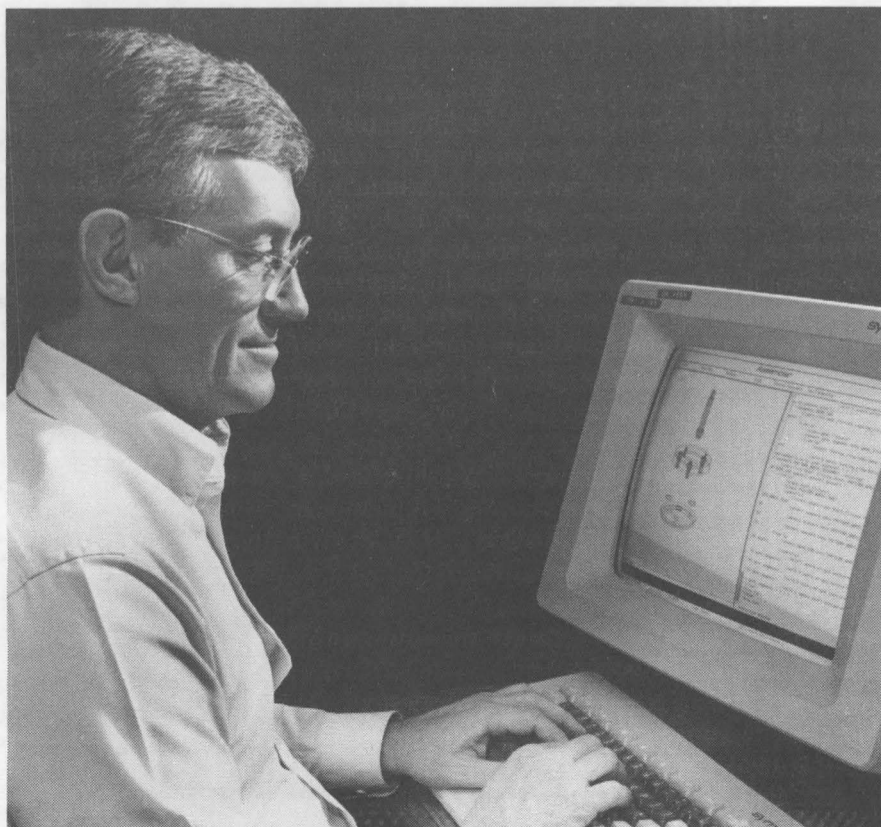
In describing the impact of the Sandia system on manufacturing in general, Dave explains that "systems like our prototype can change the relationship between design and manufacturing. Because the computer 'models' the assembly process, an engineer will quickly be able to see the effect of design changes on ease of manufacture. This opens the way for a radical change in how we design and manufacture goods.

"Furthermore," he adds, "these assembly systems will be able to automatically reconfigure themselves — making engines one day and starter motors the next."

### Begins With 3-D CAD Model

Dave's computer program begins with a three-dimensional Computer Aided Design (CAD) model of a product (see "CAD Model Helps Produce Input for Archimedes"). From this, a "gen-

PATRICK EICKER, manager of Computer Sciences Dept. 1410, checks graphic representation of a strong-link pattern wheel as the Archimedes computer program generates the assembly plan for the component. David Strip (1412) conceived the idea for Archimedes and led the R&D effort.



## CAD Model Helps Produce Input for Archimedes Program

As a starting point for the Archimedes software, Dave Strip (1412) used a Computer Aided Design (CAD) model. Currently, the user creates that solid model at the computer keyboard, using a drawing of the assembly. In the future, the solid model would be part of the design definition.

"'Computer Aided Design' covers a lot of territory," notes Paul Erickson, supervisor of the Software Techniques Division. "Basically, what we're referring to here is the use of a complete and unambiguous model of three-dimensional objects in the computer," he says.

eric" assembly plan is automatically produced that satisfies the constraints of geometry, stability, and accessibility that were deduced from the model. In the next step, a plan compiler converts the generic plan into robot-specific code.

A working demonstration of the prototype shows how a plan is created for a strong-link pattern wheel — a mechanical coding device designed to ensure the safety of nuclear weapons.

A crucial part of the work was to create routines in which mathematical descriptions of each part are manipulated in three-dimensional space. Within the computer, the spatial relationships of

**"This opens the way for a radical change in how we design and manufacture goods."**

the parts are analyzed to determine how the parts can be brought together and secured in the correct configuration. There are thousands of possible orderings for assembling the parts of the pattern wheel, only a few of which are correct.

Typically, Archimedes analyzes a number of potential ways to accomplish each assembly function, noting which is infeasible (for example, one part blocking another's path), until it finds a solution. Then it continues to another function until the assembly is complete in the computer.

Sometimes the computer finds that a fixture is required to hold parts together during an intermediate stage of the assembly sequence. In these cases, the system will automatically design the necessary hardware to hold parts during the other-

"That model is used to automatically manipulate those parts and determine the relationships among them. All those things are important for the assembly planning."

Archimedes then uses the computer model to automatically generate an exploded diagram of the assembly and produce the generic assembly plan. The program finds what parts would interfere with others, generates the swept volumes of parts along the assembly paths, and determines what paths would intersect. In general, this assembly plan is based on the relationships of the parts and the constraints of geometry.

wise infeasible operations.

A compiler takes the assembly plan and develops the instructions that are followed by a specific robot type. The plan can be retargeted to a different robot by making small changes in the compiler.

Several members of the Computer Sciences Department helped put the experimental system together, including Cliff Loucks, Colin Selleck, Jim Akins (all 1411), and Jim Bailar (contractor). ●KFrazier/NHey(3161)

## Recent Retiree



JOSEPH LOSINSKI (7222)

29

## Take Note

### Sandia Colloquia

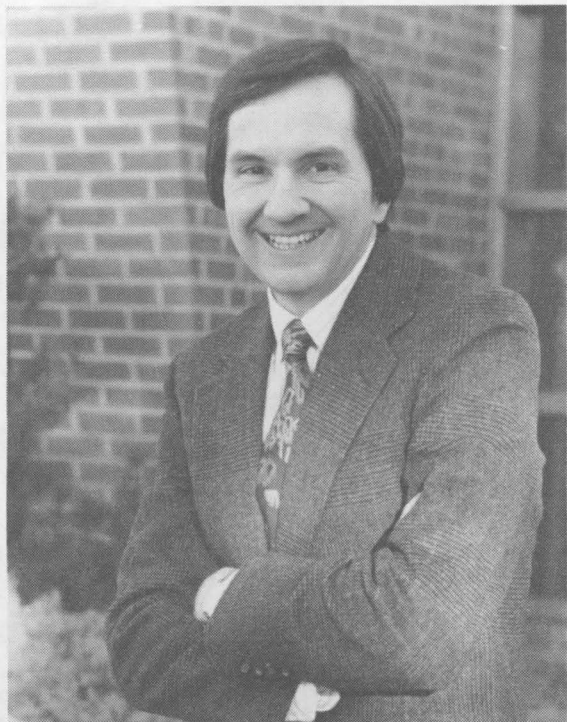
Torrance Johnson of the Jet Propulsion Laboratory will talk about "Planetary Space Probes — Voyager to Galileo" at the Technology Transfer Center (TTC — Bldg. 825) on Jan. 19 at 9 a.m. Call host Ray Bair (2110) on 4-1912 for information.

Organizer and chairman of the first international conference on vacuum microelectronics, Henry Gray, will talk about "Vacuum Microelectronics (Back to the Future)" at the TTC on Jan. 22 at 9 a.m. Call host Frank Thome (6453) on 4-5637 for information.

Jack Fuhrer, director of the Television Research Laboratory at the David Sarnoff Research Center in Princeton, N.J., will talk about "Delivery of Advanced Television to US Consumers" at the TTC on Jan. 26 at 9 a.m. Call host James Wiczer (1411) on 4-5672 for information.



## Supervisory Appointments



DENNIS BERRY to manager of Exploratory Nuclear Power Development Dept. 6520.

Dennis joined the Labs in June 1977 as a member of the Nuclear Fuel Cycle Systems Safety Division, where he analyzed nuclear power plant safety systems. He transferred to the Regulatory Assistance Division in February 1978, and later that year, to the Reactor Safety Studies Division. In May 1983, he was promoted to supervisor of the Plant Aging and Fire Safety Division. He transferred to the Space Assets Survivability Division in February 1987.

He has a BS from Pennsylvania State University, an MS from the University of California/Berkeley, and a PhD from UNM, all in chemical engineering. He's a Registered Professional Engineer. Before joining Sandia, he worked for Bunns and Roe Architect/Engineers in Oradell, N.J. He was a lieutenant in the US Navy and served at the Division of Naval Reactors, USAEC, in Washington, D.C.

Dennis enjoys outdoor activities, including backpacking, family camping, fishing, and skiing. He and his wife Marjorie have two sons and live in the NE Heights.

\*\*\*

SHANNA CERNOSEK to administrative assistant to VP of Technical Support 7000.

Shanna joined the Labs in October 1977 as an accounting clerk in the Payment Processing Division. She entered the MLS Trainee program in 1983. She has been a project coordinator in the Pulsed Energy Projects Division and a budget analyst in the Capital Planning and Control Division. In November 1985, she transferred to the Defense

Budgeting Division, where she worked with the Budget Option Group and the Modernization Task Force. She joined Business Planning and Management Results Department in July 1988 as a planning analyst, and worked on the Test Task Force project.

She has a BA in accounting from the University of Albuquerque and an MBA in management information systems from UNM. Before coming to Sandia, she worked for Western Temporary Services in Albuquerque and the *Commerce Journal* in Texas. She was nominated for the YWCA "Woman on the Move" award in 1987 and 1988. She received the YWCA Outstanding Young Woman award in 1984.

Shanna enjoys basketball, softball, Little League, school board, and parent-school association activities. She has two children and lives in the NE Heights.

\*\*\*

MARK DICKINSON to supervisor of CAE Integration Div. 2812.

Mark joined Sandia in February 1986 as a member of the Phase 1 and 2 Division, where he conducted weapon-related studies and worked on Phase 1 strategic relocatable targets and Phase 2



MARK DICKINSON (2812)

Follow-On-To-Lance. He was a member of Management Staff 400 when he was promoted.

He has a BS and MS in electrical engineering from Washington State University and an MS in management from Troy State University. Before



ROB BANWART (154-1)

joining the Labs, Mark was a member of the US Air Force; his last assignment was with DOE/OMA in weapon production, with responsibilities for Air Force weapons.

Mark enjoys reading, computers, and family activities. He and his wife Patty have one child and live in NE Albuquerque.

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ROBERT BANWART to supervisor of Payment Processing Section 154-1.

Rob joined Sandia in August 1981 as a member of the Customer and Supplier Accounting Division, where he administered reimbursable orders. In 1983, he transferred to Administrative Policies and Procedures, where he was project leader of the team that implemented the "Just-In-Time" system. In 1985, he transferred to the Management Information and Results Division, where he led a study of the budgeting system. He joined the Financial Policies and Procedures Division in 1986, and was leader of the Financial System Migration Project that is developing new financial system software for Sandia.

He has an AS in business from Danville (Ill.) Junior College, a BS in accounting from Eastern Illinois University, and an MBA from Northern Arizona University. He's a member of the Beta Gamma Sigma Honorary Business Fraternity.

Rob enjoys running, skiing, basketball, reading, Soviet studies, and travel. He and his wife Mary have three daughters and live in NE Albuquerque.

(Continued from Page Three)

### Crawford Message

needed to make it a permanent assignment."

Strategic planning at all Sandia facilities is one of our highest priorities — one that was recognized several years ago, John said. "It was clear then that the weapon business was declining; we could reduce our size accordingly, or we could further diversify and look for new opportunities to apply our technology and expertise. We chose the latter and are actively pursuing new fields of business while developing a long-range strategic plan."

John said there's a need to explore how and where Sandia technology can best be applied. "Our first priority is excellence in our existing programs. However, at the same time, we should develop new program options — ones of national importance and ones that utilize our strengths."

Economic competitiveness for the nation is the biggest challenge John sees. "We must learn how

to use the leverage that exists in our scientific community and our national laboratories to enhance the economic posture of our country. In the next decade, international power is going to be measured more by economic competitiveness than by the number of nuclear weapons a country has in the stockpile.

"I think our role as a national lab is an open-ended challenge to define and solve technical problems of national importance to this country," John continued. "It is a very broad charter, one which we should take the challenge to define if we are to optimize the impact."

"Our Lab has three basic strengths: the staff, the facilities, and our size. We have some of the best talent in the country, combined with the tools that allow us to be a full-service laboratory — all the way from research to building functional hardware — concentrated in about 1000 people."

"We have the potential, but it hasn't yet been fully tapped. If we can learn how to capitalize on our strengths, we should be faster and more responsive than anywhere else I know." ●BLS



SHANNA CERNOSEK (7000)



# MILEPOSTS

## LAB NEWS

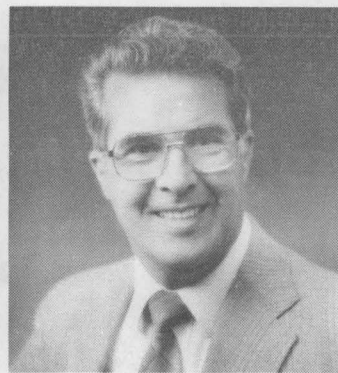
January 1990



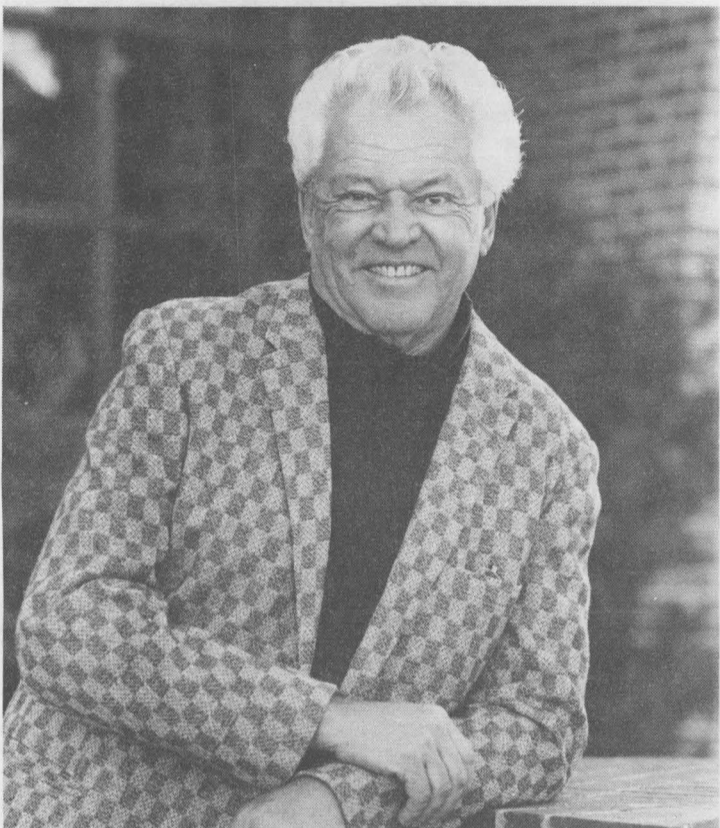
Jim Bartel (8441) 15



Jean Kamp (8161) 30



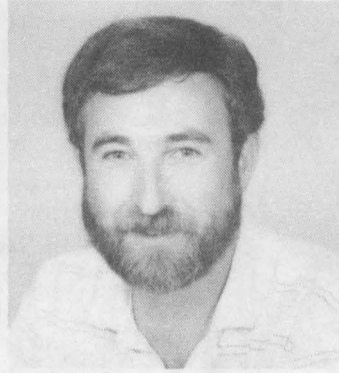
Ray Chavez (3154) 30



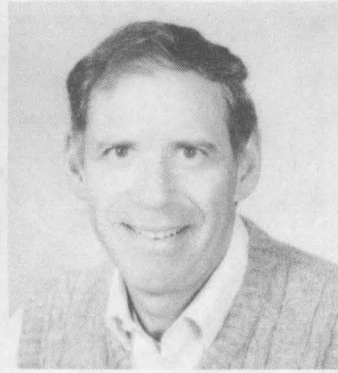
John Wood (3424) 35



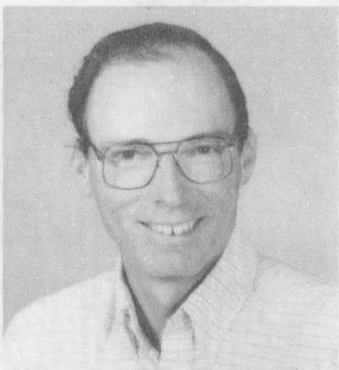
Fred Perez (8513) 20



Dan Morse (8347) 20



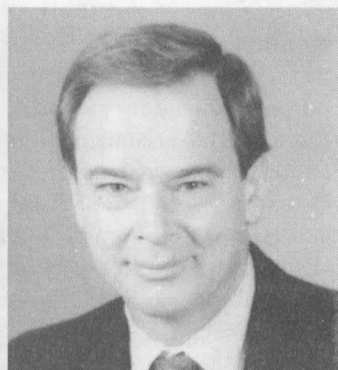
Joel Lipkin (8171) 20



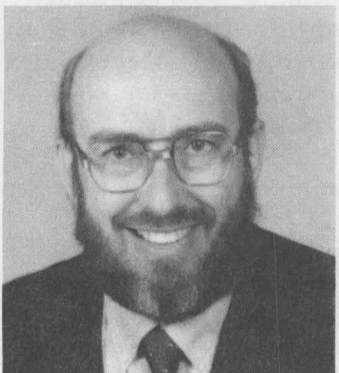
John Keilman (8241) 20



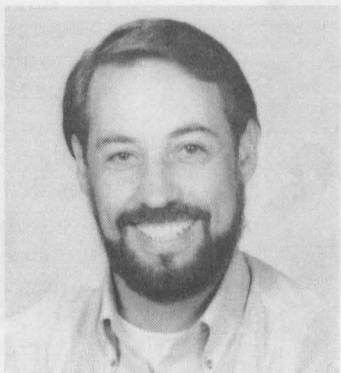
Joan Madsen (8237) 30



Sheridan Johnston (8364) 20



Wil Jorgenson (8442) 20



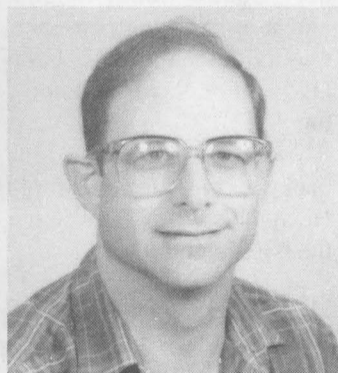
Al DuCharme (8511) 20



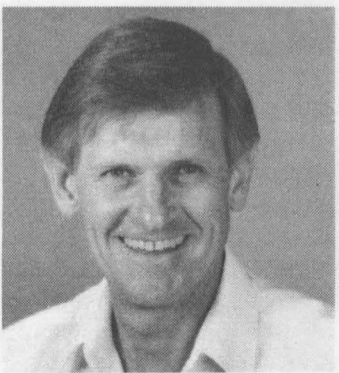
Mel Callabresi (8243) 20



Cecil Tucker (6453) 30



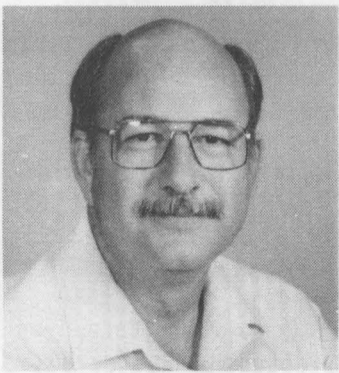
Mike Baskes (8312) 20



Ken Tschritter (8283) 25



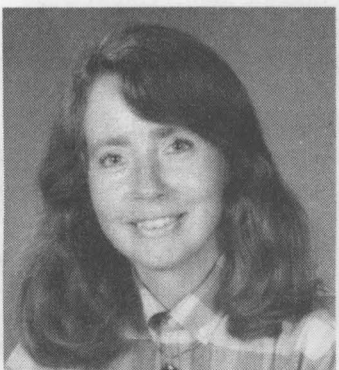
Mary O'Shea (8524) 30



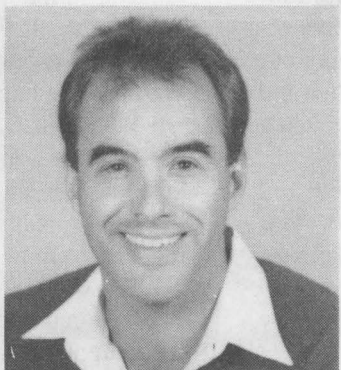
Ed Diemer (8536) 15



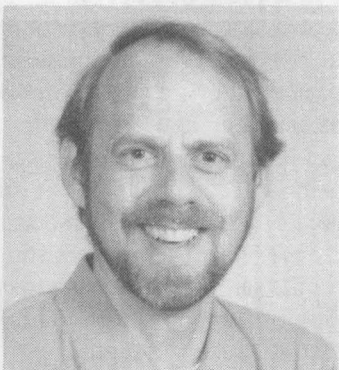
Carol Kaemper (21) 20



Mary Gould (8526) 20



Dale Boehme (8313) 15



Gary Kirchner (8453) 20



# Can the USSR Survive Gorbachev?



The astounding changes taking place in the Soviet Union and Eastern Europe will be discussed at Sandia by a foreign-policy expert on Tuesday, Jan. 23, at noon in the Technology Transfer

Center. The Community Focus talk — "Can the Soviet Union Survive Gorbachev?" — will be given by University of New Mexico political science professor Greg Gleason. Seating is on a first-come basis.

Gleason is coordinator of the UNM International Conflict and Cooperation Project, which conducts research and promotes public discussion of international affairs.

"The events of 1989 surprised the world and challenged conventional interpretations of the Soviet Union and its satellites in Eastern Europe," Gleason says. "In just four short years, the political climate spawned by perestroika and glasnost has precipitated the most sweeping political realignments of the last 40 years.

"We should not doubt," he continues, "that in the halls of the Kremlin there are many who look forward from the events of 1989 with a sense of foreboding. History may record Gorbachev as the man who freed Berlin. But we should not forget that there are those in Moscow who look on him as the man who lost Berlin."

Gleason is the author of *Federalism and Nationalism: The Struggle for Republican Rights in the USSR*. His primary research interests concern the relationship between Soviet domestic politics and Soviet international behavior.

Gleason received a PhD in political science

from the University of California at Davis. He also has a master's in Russian and has held post-doctoral research fellowships from Stanford University's Hoover Institution and the Smithsonian Institution's Institute for Advanced Russian Studies.

Future speakers scheduled for the Community Focus series (dates, places to be announced later) include New Mexico District Court Judge Anne Kass on family court issues; Albuquerque Technical-Vocational Institute President Ted Martinez on Sandia/T-VI cooperation; a representative of the Albuquerque Police Department Gang Unit on youth gang activity in the city; Albuquerque Teachers Federation President Don Whatley on the education restructuring movement in Albuquerque and the nation; UNM Athletic Director Gary Ness on athletes as students and coaches as educators; and former UNM history professor Donald Cutter on the Spanish heritage of New Mexico. ●

# Take Note

Al Stotts (3163) has been elected president of the board of Alta Mira Specialized Family Services, Inc. A United Way agency, Alta Mira serves developmentally disabled infants and their families, provides respite services for developmentally disabled adults, and conducts outreach and training services for rural communities in New Mexico.

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Sandia's Women's Program Committee is sponsoring a talk by Marta Weigle, UNM Professor of American Studies and Anthropology and chair of the American Studies Dept., Jan. 26 at noon in Bldg. 815 (outside the Tech Area). Her talk will be about women and the major themes of New Mexico folklore. She has written extensively about Southwestern life and lore and about women and mythology. Lunch is brown-bag, and seating is on a first-come basis. For those who can't attend, a videotape will be available from Vickie DiMarzio (3511) on 4-9482.

## WIPP Follow-up

In the many stories we ran in the last issue featuring Sandia's role in the Waste Isolation Pilot Plant (WIPP) project, we missed mentioning one Sandian who provides lots of needed support — V.L. "Sam" Baker of Field Support and Logistics Div. 9334.

One of several Sandians who commute to Carlsbad regularly, she operates a one-person buyer's office in Carlsbad, securing about 80 percent of the goods and services for Sandia's WIPP operations. Sam also has shipping and receiving duties. She's a 28-year Sandia veteran. ●

## Financial Seminar

Daisy Johnson and Mary Mahoney, representing the Financial Network Investment Corporation, will present a three-program series, "Financial Puzzles," for Sandians this winter. The first presentation, "Risk: The Central Piece of Your Financial Puzzle," is Jan. 16 from 5 to 6 p.m. at the Coronado Club. Contact Daisy Johnson on 291-8585 for information.



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

### MISCELLANEOUS

- UTILITY TRAILER, 4' x 8', \$100. Shane, 294-4920.
- WOMAN'S BIKE, 3-spd. used in the Tech Area, free to good home. Mason, 281-3052.
- DINING TABLE, 6 chairs, matching cabinet, \$625 OBO. Joseph, 299-6989.
- WASHING MACHINE, Penney's, heavy-duty, 3 spds. plus hand wash, 5 temperature settings, never serviced, original owner, \$125. Barr, 821-5870.
- CORNING ELECTRIC COOK TOP, \$50; Sorell boots, woman's size 7, \$40; homemade storage-stools, 20" tall, \$5/ea.; Yamaha guitar, \$45. Hall, 243-3672.
- HAFNER DH-101 PREAMPLIFIER, assembled from kit, \$100. Linebarger, 275-7931.
- SINGER SEWING MACHINE, wooden

- cabinet, \$100. Padilla, 831-0330.
- CROSS-COUNTRY SKI BOOTS, Fabiano model 398, size 9M, never used, cost \$65, sell for \$35 OBO. Rodacy, 293-2668.
- TANZANIAN HIKING TRIP, hike Mt. Kilimanjaro and national wildlife reserve in Tanzania, Feb. 28-March 12, organized with Tanzanian ambassador. Dollahon, 298-1151.
- RUGER SECURITY SIX, .357, stainless, 6" barrel, target sights, holster, ammo, cleaning kit, \$300. Shapnek, 281-5913.
- STEEL RIM, size 5-JX14, Nissan, w/balanced 185/70 SR14 radial tire, fits Nissan tire well, \$55. Huebner, 256-0978.
- BIKE CARRIER FOR CHILD, \$10; full-size mattress, \$100. Anderson, 897-2272.
- TRACTOR MOWER, Wheel Horse, 40" cut, electric start, 11-hp, headlights, twin chutes, extra battery, dump-bed trailer, \$1400. Kaiser, 296-5215.
- MARTIN COUGAR SPEED-FLITE BOW, 65-80 lb., 30", 65% cams, green camo, Huntmaster rest, fine-line crosshair sight, \$185. Schroeder, 869-2243.
- BABY CRIB, \$60 OBO; color TV, cost \$260, sell for \$80. Stanley, 296-2946 after 5.
- DASH MAT, for '87 Subaru wagon, brown, \$15; Kessinger, 275-2590.
- NIKON F2AS CAMERA BODY, \$350; Vivitar Series I macro-zoom 75-210, \$175. Soo Hoo, 294-0268.
- KENMORE GAS RANGE, gold, \$130 OBO. Martinez, 884-5047.
- DOUBLE BUILT-IN OVENS, Hotpoint electric, upper self-cleaning, avocado doors, \$20 OBO. Case, 293-5466.
- RECLINER, La-Z-Boy type, washable brown covers, \$40. Hubbard, 281-1779.
- AIRCULATOR, for fireplace, pushes hot air into room, \$50. Hart, 293-0234.
- MACINTOSH 512KE, including external 800K drive, ImageWriter printer, tilt stand, w/power conditioner. Loucks, 281-9608.
- RADIO-CONTROLLED AIRPLANE, Futaba 6-channel radio, 4 servos, 2

- Super Tigre engines, extra parts and supplies, \$350 OBO. Prins, 821-0490.
- ROCKPORT PRO-WALKERS SHOES, worn once, woman's size 8-1/2B, \$40. Romine, 828-9614.
- IBM-COMPATIBLE PC, Leading Edge hard disk and monitor, 18 months old, \$1100. McCoy, 821-2509.
- COUCH AND CHAIR, brown velour, \$250. Davis, 294-1048.
- CULTURED PEARL NECKLACE, 18" strand w/pearls averaging 7mm ea., appraised at \$700, sell for \$350 OBO. Martinez, 888-3067.
- GAS RANGE, Montgomery Ward, almond, self-cleaning, pilot-lightless; kitchen table and 6 chairs, all wood. Romero, 298-7934.
- HOBBY HORSE, \$30. Strascina, 294-0305.
- PORTABLE BAR, w/built-in AM/FM radio and stereo, 3-1/2' H x 4' W, w/stools, \$100. Colgan, 883-2713.
- SKI BOOTS, 2-buckle, size 11M, \$100; linoleum flooring, blue & white, 6' x 6', \$50; Canon A-1, AE-1, zoom lens, Vivitar 3500 flash. Harris, 268-4432.
- KENMORE DRYER, white, uses 110V, \$200. Rightley, 888-7539.
- WURLITZER STUDIO PIANO, mahogany finish, \$900; wingback chair, w/ottoman, \$50. Shrouf, 821-0765.

### TRANSPORTATION

- '84 DODGE ARIES, 4-cyl., 2.2 engine, AT, radio, AC, 78K miles, will sell below retail. Danella, 892-2892.
- '84 GRAND PRIX BROUGHAM, tinted PW, PL, sunroof, stereo cassette, cruise, AC, \$4800. Carriaga, 877-2646.
- '85 JEEP CHEROKEE LAREDO, gold, 2.5L, 5-spd., 50K miles, \$7800. Osburn, 298-0354.
- '80 BUICK CENTURY, one owner, new tires, V-6, 4-dr., AM/FM cassette stereo, \$1800. Sikora, 881-4741.
- '86 HONDA CIVIC DX, original tires, 34K miles, tinted windows, AT, AM/FM cassette, tilt, cruise, AC, \$5200. Rody, 299-6084.

- '83 CHEV. CITATION, fuel-injected, 4-cyl., AT, AC, PS, PB, 67K miles, \$2200; '82 Mazda RX-7, AC, 56K miles, \$5000 OBO. Bronkema, 292-6342.
- '86 CHEV. CAMARO, loaded, T-tops, louvers. Hamilton, 881-2705.
- '82 HONDA CIVIC, 5-spd., 94K miles, \$2500 OBO. Anderson, 897-2772 after 5.
- '66 PLYMOUTH SPORT FURY, 2-dr. hardtop, being restored, 383, AT, PS, PB, console, bucket seats, \$1650. Fowler, 888-1348.
- '86 PLYMOUTH COLT, 3-dr., 4-spd. manual, AM/FM cassette, new clutch and transmission, 41K miles, \$3500 OBO. Simpson, 296-4588.
- '84 VW JETTA, 4-dr., 5-spd., AC, AM/FM cassette, cruise, sunroof, \$4100 OBO. Holmes, 292-0898.
- '67 MUSTANG 2+2 FASTBACK, partly restored, 4-spd., priced at \$8400 to \$9100, sell for \$8000; girl's 16" bike, \$30. Strascina, 294-0305.
- '84 FORD BRONCO, XLT package, PS, PB, AC, AT, new tires w/chrome wheels, 4-speaker stereo system, \$6700. Martinez, 888-3067.
- '84 PLYMOUTH VOYAGER LE, one owner, complete service records. Schroeder, 296-1011.
- '89 SEA BREEZE MOTORHOME, 22', self-contained, Toyota V-6 engine, AT, OD, 8K miles, below book, \$26,000. Swain, 265-0098.

### REAL ESTATE

- 3-BDR. MOBILE HOME, '73 model, 14' x 65', 10' x 20' tip-out LR, \$12,850 SLFCU-value, sell for \$8500 or trade for auto/pickup of equal value. Dollahon, 897-1414.
- 3-BDR. TOWNHOME, 2-1/2 baths, 2200 sq. ft., over-size 2-car garage, Juan Tabo/Candelaria area, assumable 10% FHA, \$110,000 OBO. Kemm, 294-3959.
- 4-BDR. NORESTE HOME, new, La Cueva High School area, 2-3/4 baths, LR, DR, view, \$195,000. Vigil, 1-471-5004.
- 2-BDR. ANGEL FIRE CONDO, fully fur-

- nished, 2 full baths, sleeps 8, \$47,000. Krahling, 294-2623.
- 3-BDR. HOUSE, Lomas/Juan Tabo area, 1450 sq. ft., 1-3/4 baths, FP, redwood deck, storage building, fully landscaped. Givler, 292-5278.
- 2-BDR. TAYLOR RANCH HOUSE, 1-1/2 baths, 1-car garage, landscaped, assumable loan, no qualifying. Evans, 899-0406.
- COLORADO LAND, on Rio Grande, near South Fork, Colo., water, electricity, views, will finance, \$35,000. McCoy, 821-2509.

### WANTED

- PORT-A-CRIB, collapsible, for child up to 3 years. Underhill, 294-5774.
- MANUAL for HP11c calculator. Lyo, 299-6470.
- PROPANE BOTTLE, 100-lb. Nielson, 294-2643.
- CHILD'S SKIS, Karhu Ski-Go, any length over 100cm, must fit special Ski-Go boots. Shirley, 821-0480.
- BEDROOM SET, for young boy, bunk or twin-size, w/dresser. Colgan, 883-2713.
- HOUSEMATE, to share 3-bdr. home, 2 baths, separate living areas, kitchen, laundry facilities, enclosed yard, free utilities. Nordeen, 296-7898.
- SOUTHWEST AIRLINE COMPANION PASSES from Kentucky Fried Chicken, to help with travel for twins. Turpin, 281-5933.

### LOST AND FOUND

- LOST: 14K 2" long earring jacket; 14K heart-shaped earring w/2 sapphires; lost between cafeteria and T-29 on Jan. 2. Lee, 296-3317.

### SHARE-A-RIDE

- CARPOOL PASSENGERS WANTED, from Indian School and Washington area. Karnowsky, 255-4045.



**Coronado Club Activities****Family Fare = Food and Fun At Bargain Prices**

A FAMILY BLAST tonight features prices reminiscent of the '60s. Family Fare menu selections include a spaghetti plate or hamburger plate for just \$1.50/person — or a chicken/fish supper for \$4.25. After-dinner entertainment: a juggling show (7-8 p.m.) by juggling expert Robbie Weinstein, who's promised to teach some people in the audience how to throw a bunch of stuff up in the air and keep it there.

FIRST SUNDAY BRUNCH OF 1990 is Jan. 21, 10 a.m. to 1 p.m. The mouth-watering menu includes Virginia baked ham, baron of beef, Denver omelets, Belgian waffles, scrambled eggs, bacon, hash browns, and much more. It's still the best buy in town — just \$6.95/adults, \$3.50/children 3 through 11, and free/toddlers under 3.

ALWAYS ON WEDNESDAY — That's the night square dancers gather to strut their stuff. Free lessons again next Wednesday (Jan. 17) from 8 to 10 p.m., and four more weeks of lessons after that

(beginning Jan. 24) for just \$10/couple. There's an extra bonus thrown in: Square dancing is a great way to work off those extra pounds left over from the holidays!

GET ALONG, LITTLE DOGIES, to Western Night next Friday (Jan. 19), when the chow-line special is T-bone steak for \$7.95/person. Country/western dance lessons (6-7 p.m.) are free for folks with dinner reservations. Afterward, enjoy more stompin' to the down-home tunes of Billy Glenn & Texas Sand from 8 until midnight. Reservations recommended (265-6791).

CORONADO SCHUSSBOOMERS (aka Coronado Ski Club members) get together this month on Tuesday, Jan. 16. Social hour begins at 7 p.m., and the general meeting — featuring speakers from Monarch Ski Area and REI Sporting Goods — starts at 7:30. Some dazzling door prizes are available for a few lucky people, and you can still sign up for a few of this winter's ski trips.

ATTENTION, BINGO BUFFS: There's one more chance to game this month — next Thursday (Jan. 18). Card sales start at 5:30 p.m., and early birds get first shot at the prizes in a game starting at 6:45. Price of a single package is still just \$5, with double and triple packages going for \$9 and \$13, respectively.

SPEAKING OF GAMING, those crafty T-Bird card sharks swim back into action on Thursday, Jan. 18, starting at 10 a.m. We have it on good authority that 1990's the year this intrepid group plans to once and for all beat those Las Vegas dealers at their own game. Come on out and learn how — and enjoy gratis goodies and convivial conversation at the same time.



A request for Sandians to help with a new tutorial project at Eldorado High School has been received by the Volunteers in Action program. Tutors are especially needed in math, physics, chemistry, languages, and basic study skills, such as outlining and reviewing. Volunteers are needed one night a week for two hours to work one-on-one with students in the school's Media Center. Call Al Stotts, Community Relations Division 3163, on 4-2282 for more information.

**Sympathy**

To Linda Greenwood (2115) and Richard Chapman (144) on the death of their father and to Nina Chapman (3301) on the death of her father-in-law in Albuquerque, Dec. 16.

To Ken Bercaw (7816) on the death of his infant son in Albuquerque, Dec. 18.

To Martha Martinez (5166) on the death of her father in Albuquerque, Jan. 1.

**Events Calendar**

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

Jan. 12-21 — "Who Ya Callin' a Lady?" back by popular demand, celebration of women, new pieces added; 8 p.m. Fri. & Sat., 6 p.m. Sun.; Vortex Theatre (2004-1/2 Central SE), 247-8600.

Jan. 12-Feb. 15 — Exhibit of Eliot Porter photographs taken between 1940 and 1983 of various New Mexico locations, 9 a.m.-5 p.m. daily, New Mexico Museum of Natural History, 841-8837.

Jan. 12-March 4 — Exhibit, "Adventures West," 50 masterworks from the National Cowboy Hall of Fame and Western Heritage Center, including paintings and sculptures by Frederic Remington, Charles Russell, Olaf Seltzer, N.C. Wyeth, Joseph Sharp, and members of the Taos Society of Artists and Cowboys Artists of America; 9 a.m.-5 p.m. Tues.-Sun., East Gallery, Albuquerque Museum, 243-7255.

Jan. 13 — Children's Dance Workshop, presented by Ballet West from Utah; 2 p.m., South Broadway Cultural Center, free, 848-1320.

Jan. 13 — "New Age Music," performed by Andy Narell; 7 p.m., KiMo Theatre, 848-1374.

Jan. 13 — Martin Luther King Birthday Celebration: gospel music and presentations on racism, education, and justice in the 1990s; 7-9 p.m., South Broadway Cultural Center, free, 848-1320.

Jan. 14 — Chinese Music Appreciation: folk songs, violin and piano, Chinese musical instruments, sponsored by the Albuquerque Chinese Chorus and UNM Chinese students; 8 p.m., Keller Hall, 277-4402.

Jan. 14 — Wright Brothers, Vaudeville comedians; 2 p.m., KiMo Theatre, 848-1374.

Jan. 19 — Momix, modern dance; 8 p.m., KiMo Theatre, 848-1374.

Jan. 19 & 20 — Classical Concert Five: New Mexico Symphony Orchestra w/guest conductor William Henry Curry and pianist Jeffrey Siegel, performing works by Wagner, Schumann, and Copland; 8:15 p.m., Popejoy Hall, 842-8565.

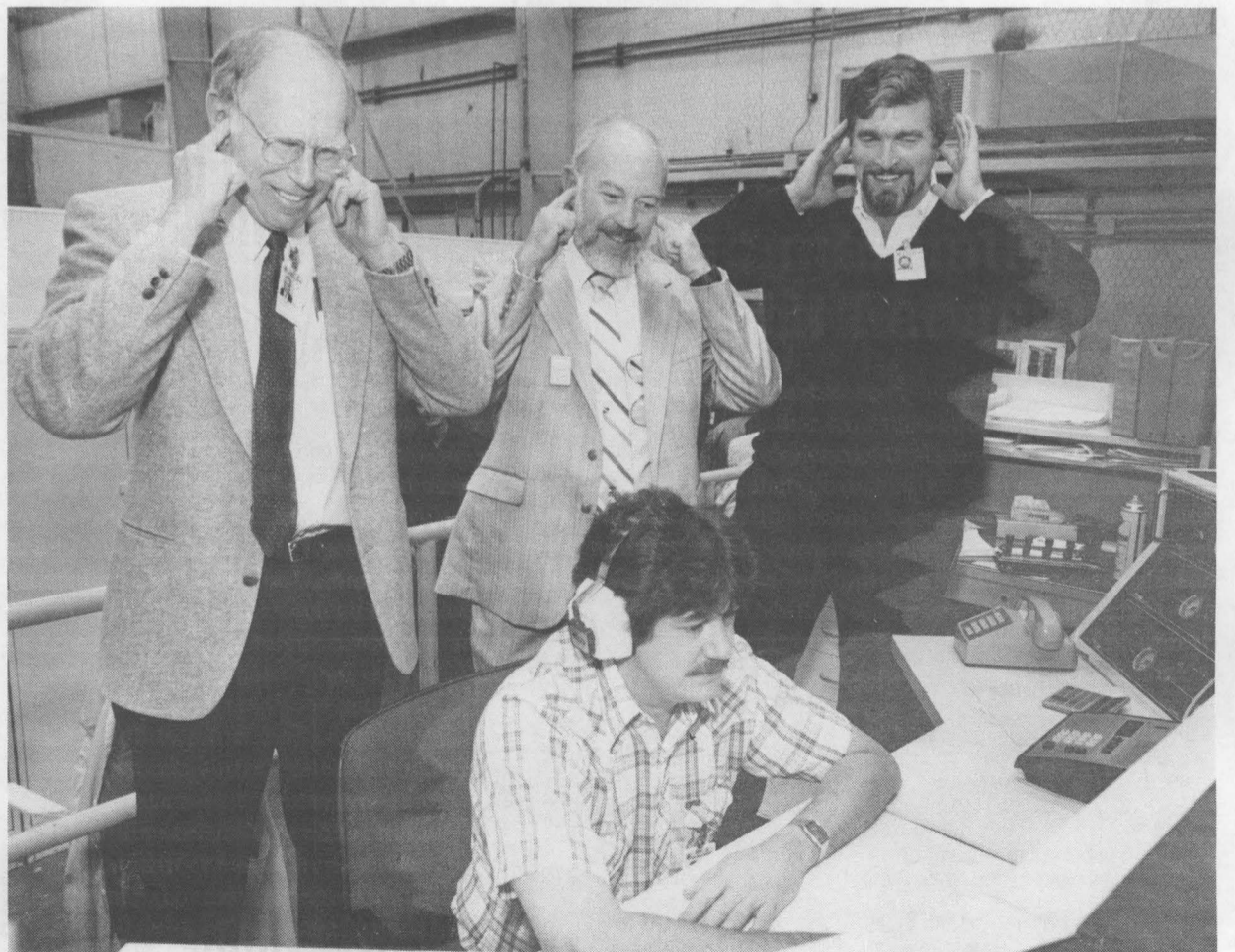
Jan. 21 — "Yeh Cric Yeh Crac: Songs and Stories From Africa and Beyond," musical folktales from Africa and other cultures, accompanied by traditional African instruments; 8 p.m., South Broadway Cultural Center, 848-1320.

Jan. 24 — Subscriber Appreciation Night: New Mexico Symphony Orchestra conducted by Neil Stulberg, performing works by Mozart, Tchaikovsky, and Rimsky-Korsakov; free to 1989-

90 nine- or six-concert subscribers (1 ea., first-come), remaining tickets available for sale to general public; 8:15 p.m., Popejoy Hall, 842-8565.

Jan. 24-Feb. 4 — "Nero's Last Folly," text and performance by Italian comedian and circus performer Leo Bassi, one-man performance scrutinizes three classic circus gestures — a pie in the face, a juggling act, and a fire-swallowing routine; 8 p.m. Tues.-Sat., 2 p.m. Sat. & Sun. matinees, special "Pay What You Can" performance 7 p.m. Jan. 28; KiMo Theatre, 243-4500.

Jan. 25 & 26 — Odetta, folksinger with operatic voice; 8 p.m., South Broadway Cultural Center, 848-1320.



"FINAL POP" — After more than 30,000 "shots," Sandia's HERMES II gamma-ray simulator was fired for the final time on Dec. 22. The facility was used to test hundreds of weapon and space-system components during its 20-year life. Preparing for the final loud pop are (standing, from left) Ken Prestwich, manager of Pulsed Power Applications Dept. 1240; Tom Martin, research scientist of Pulsed Power 1290; and Jerry Zawadzkas, supervisor of STL Operations Division 9343. Seated at the control console is Gary Devlin (contractor). Ken and Tom designed and helped build HERMES II in the late '60s. Sandia's gamma-ray simulation work is now done on a newer machine named — what else? — HERMES III.