Reflections

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A letter from the Director

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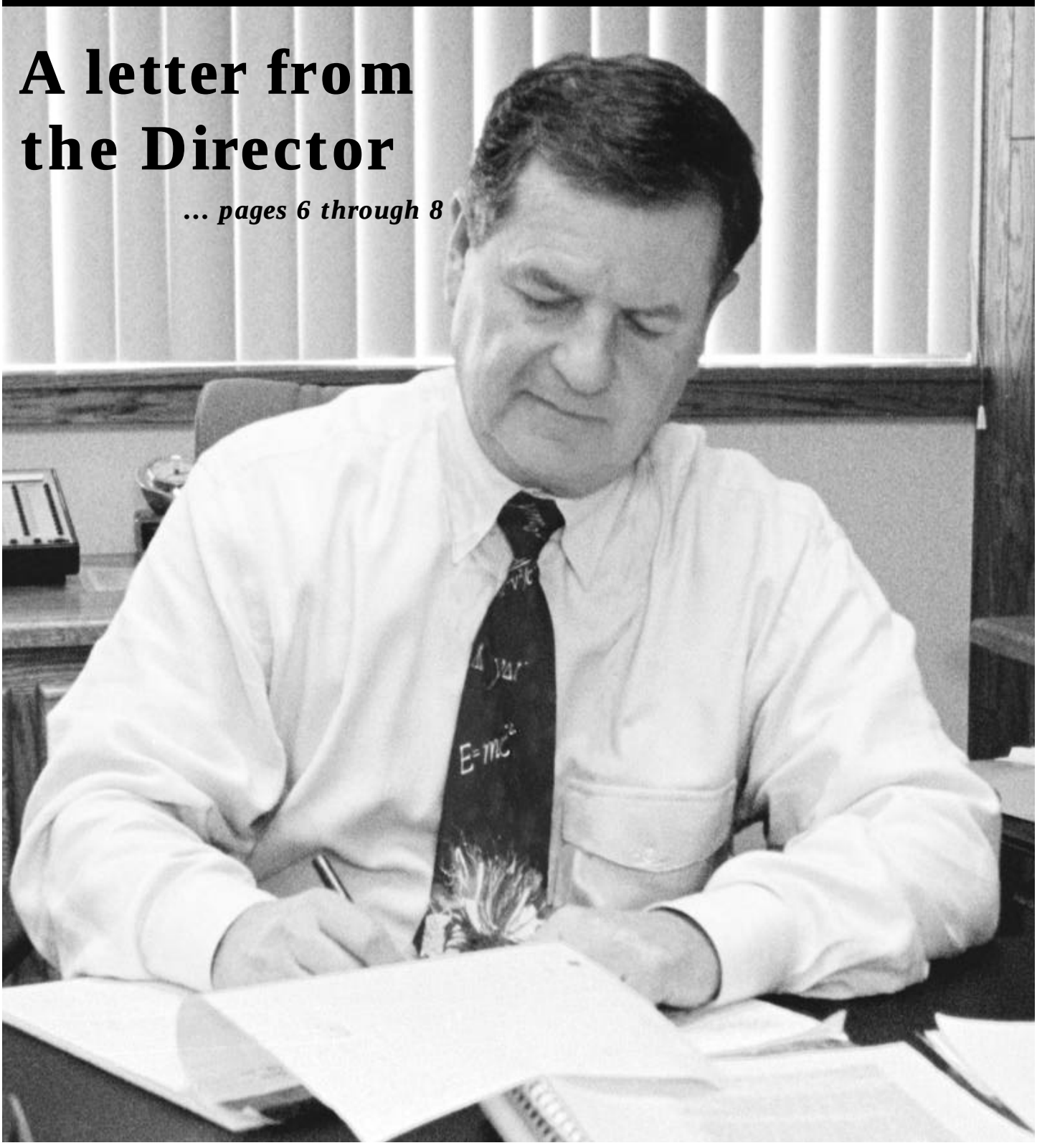

A Department of Energy/University of California Laboratory

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Reflections

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editor's journal

Communication ... it's a two-way street

According to *Webster's New World College Dictionary,* communication is "the act of transmitting, giving or exchanging of information, signals or messages as by talk, gestures or writing." It also says communication is "the art of expressing ideas, especially in speech and writing."

Although I have worked in the communications field for several years and was pretty sure I knew what communication meant, I looked up the word in a dictionary just to be certain that exchanging, or sharing, information was part of its formal meaning. For if we focus on the information-sharing aspect of communication, then it seems to me that most of us have a strong desire to communicate. And why shouldn't we. We've been asking questions and sharing information since we were small children, first learning about the world around us.

I believe that many misunderstandings among friends, family members, strangers, races, nations, and employers and employees are caused by a lack of information or a failure to communicate. We harbor resentments, prejudices, fears, distrust and misconceptions simply because we don't have enough information to make sound judgments, have incorrect information or have no information at all.

On the job, most of us need to feel empowered. And as they say, knowledge, or information, is power. We need to believe that our employer keeps us informed about those things that affect the quality of life in the workplace and our ability to do our jobs safely and efficiently. When we don't get this information from management, we tend to look elsewhere for it, often falling victim to the rumor mill. Offsetting rumors is just one of the reasons I think it's essential for an organization to keep its employees informed in a timely manner.

And while most people believe managers should take the lead in communicating with employees, communication isn't the sole responsibility of management. Communication is a two-way street that both managers and employees actively need to travel. As employees, we shouldn't sit back waiting passively to be informed in a manner that is "convenient" for us. Doing so can leave us uninformed, misinformed and deeply frustrated.

A case in point: An employee called Public Affairs several months ago upset because he had just heard about a Lab-related issue of great concern to him. He wanted to know why he had to read about it in a local paper and demanded to know why employees weren't being given this information on the job. I explained to him that the Daily Newsbulletin had run an article on the subject the previous week. He replied that he didn't read the Newsbulletin because he didn't like to go online. I then pointed out to him that an all-employee memo on the subject had been distributed the same day the Newsbulletin article appeared on the Web. He countered by saying he gets too much mail in his office and never reads employee memos. Would he have gone to a meeting called by his management to discuss the issue, I sheepishly asked? That would depend on who called the meeting and when it was held, he replied, noting that he is an extremely busy person.

Needless to say, the caller struck a chord with me. He wanted timely information on the job but was unwilling to make any real effort to obtain it. And he was angry with everyone but himself for his being uninformed about something he obviously cared about.

The way I see it, we as employees have an obligation to ask questions and routinely seek out information in the workplace, the same way we do in our private lives. Many employees already take this obligation seriously. Take for example, the employee who called Public Affairs early one Monday morning concerned that "Last Week's Headlines" in the Daily Newsbulletin had not yet been posted on the Web. The employee had been on vacation and wanted to start off the week by catching up on any news or information he may have missed in his absence.

Good communication isn't easy; it takes time and effort. But it is something we all have to work at and share in the responsibility for. And speaking of sharing, Laboratory Director John Browne communicates some of his thoughts about the Laboratory and its future in this month's issue of "Reflections," beginning on Page 6.

Seaborg Institute explores elements with an attitude

David Clark, director of the Los Alamos branch of the Glenn T. Seaborg Institute

by William Heimbach

Actinide chemistry, a darling in the glory days of nuclear science, grows rare and more valuable as its practitioners dwindle.

"It was the hot topic 40 to 50 years ago. Everyone was interested in the actinides," says David Clark, director of the two-year-old Los Alamos branch of the Glenn T. Seaborg Institute for Transactinium Science, named after the co-discoverer of plutonium. "Now, in the year 2000, only a handful of scientists in the country are studying any aspects of nuclear chemistry."

Indeed, actinides — those radioactive elements with an attitude — were a mystery that many sought to solve in the early-century scramble to get the nuclear genie out of the bottle.

Now the field of nuclear chemistry has primarily retreated behind high security fences at the Department of Energy laboratories. There, unlocking the mysteries of radioactive elements as they decay and interrelate with other materials will bring solutions to the most profound problems of the nuclear age.

The radioactive elements known as actinides both serve and plague mankind. Plutonium, the most famous of its cousins — which include uranium, thorium, neptunium and americium — is both hero and villain.

It is the heart and soul of a nuclear weapon and provides a valuable energy source for electrical-power generation and deep-space exploration. It also has produced massive waste problems that will keep scientists scratching their heads far into the 21st century.

"Atomic and molecular-level understanding of actinides will provide the scientific foundation for cleaning up our nuclear legacy, and for predictions of weapons aging and safety, which is particularly important in the absence of nuclear testing," Clark says.

"The university component of the science is steadily decreasing because it's expensive to deal with radioactive materials and radioactive waste," he says. "Also, as university professors in the field retire, they are not being replaced."

Clark spearheads an effort to pull together a cross-pollination of science — such as theoreticians, material scientists, structural chemists and spectroscopists — to better understand actinides at the most basic level.

"This approach takes us back to our roots at Los Alamos of teaching one another," he says. "We're good at that."

About 200 scientists, technicians, postdocs and students now work at Los Alamos under the wide umbrella of the Seaborg Institute. They primarily target two goals.

The first is to understand radioactive elements well enough to know how they will behave as they age and decay. Knowing what plutonium does in a weapon in the field, for example, is the underpinning of Science-Based Stockpile Stewardship.

"A plutonium atom in an alloy will change position once every 10 years as a result of self-irradiation," Clark says. "We need to know more about this and its effects."

Second, actinide scientists are being depended upon for answers on nuclear-waste management. Whether it's cleaning up existing waste or working toward making plutonium-processing facilities such as Technical Area 55 "zero effluent" operations, these scientists must provide the roadmap to these solutions.

"We also must provide an educational and training element," explains Clark. "It is absolutely critical that we train people for this mission. First, we need to train this generation, and then the next generation."

To this end, the institute has sponsored dozens of visiting speakers, workshops and seminars, sabbatical professors and an actinide chemistry course at the University of New Mexico.

"We need to create a sense of intellectual community in actinide science," Clark says, "and if we work together, we'll be much more successful both in science and program development."

ITS Los Alamos
Institute for Transactinium Science

About 200 scientists, technicians, postdocs and students now work at Los Alamos under the wide umbrella of the Seaborg Institute.

Cleaning the air, brick by brick

by Kay Roybal

A Native American engineer has drawn inspiration from ancient traditions in developing a modern technology that may help the world breathe a little easier.

Robert Marquez, a Lab graduate research assistant working on his doctoral degree at New Mexico State University has fashioned a simple, inexpensive way to allow brickmakers to pursue their craft without polluting the air.

Marquez' clay kiln, developed in Juarez, Mexico, under the sponsorship of the El Paso Community Foundation and the Southwest Center for Environmental Research and Policy, has prompted inquiries from foreign countries, including India, Egypt, Ghana and Vietnam — developing countries where the brickmaking industry is a major contributor to air pollution and attendant health problems.

Historically, hundreds of Juarez families have used brickmaking kilns like the one pictured above using whatever fuels they could find. These kilns produced clouds of polluting black smoke. *Photos courtesy of Robert Marquez*

Marquez' invention — two beehive-shaped, covered kilns connected by a fired-brick tunnel of fired brick filled with raw clay bricks — can be inexpensively constructed of available materials. The tandem kiln dramatically reduces particulates released into the air, regardless of the fuel used to cook the bricks, and the soot-blackened raw bricks can be recycled as fuel.

There is an added incentive for brickmakers to use the new, cleaner technology: It uses less fuel than the old method.

This low-tech solution to a worldwide dilemma evolved from Marquez' return from the corporate world to his roots in the natural world.

The son of a Deming ranch hand, Marquez and his four brothers and three sisters worked the fields; he often spent days alone on horseback retrieving livestock.

"Being alone in the mountains, you do a lot of thinking and dreaming," he said. "You notice how clouds form to make rain. That was when I became interested in natural sciences."

Ten years after receiving his mechanical engineering degree from NMSU and working for computer giant Hewlett-Packard in Boise, Idaho, and Greeley, Colo., Marquez said, "I decided to come home to make a difference."

He taught for two years at Dine College on the Navajo Reservation, where he started a science honors program. But his lack of a doctorate limited his access to funding, so he returned briefly to Hewlett-Packard to earn funds for more schooling.

"I got to work on the high-tech end of things," Marquez said. "But it's always more difficult and more challenging to arrive at a solution without much to work with. That's what I was after in a doctoral project."

While seeking a problem to address, Marquez attended a Navajo Blessing Way ceremony conducted by his father-in-law.

"I thought about how Mother Nature cleans with soil and water," he said. "Wind can clear the air, but dust storms scrub the air better than wind alone."

Marquez became concerned about pollution from the gigantic Four Corners Power Plant while living on the Navajo Reservation and initially intended to design a catalytic converter for power plants using clays. But working with NMSU professor and clay chemist Antonio Lara and the Lab's Karl Staudhammer of Materials Technology: Metallurgy (MST-6) sent him in a different direction.

Staudhammer had been working to reduce pollution in the El Paso airshed basin caused largely by the hundreds of Juarez families engaged in primitive brickmaking operations that use fuels such as old tires, trashed combustible materials, wood pallets and treated scrap wood from

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Brick by brick ...

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furniture factories. The old kilns would produce plumes of black smoke visible for miles. Staudhammer had designed a method of using natural or liquefied propane gas to fuel the kilns, but the crash of the Mexican economy in the early 1990s sent the price of gas out of reach for the cash-poor brickmakers.

Marquez began working as a graduate research assistant with Staudhammer in June 1995. Collaborating with the Mexican Federation of Private Health and Community Development Associations, or FEMAP, Marquez developed a number of inexpensive analytical testing methods for soils, then tackled the big issue of kiln smoke abatement.

"Pollution problems are best solved by the people closest to the problem, with the appropriate technologies," Marquez said. "After the recession in Mexico, the price of gas forced people back to burning nonenvironmental fuel. Pollution in the El Paso del Norte airshed causes health hazards in two cities and two countries.

"We had to find a low-tech solution within the brick-makers' economic means," Marquez said. "Soil, heat and labor were the only resources we could count on. Clays not only are strong sorbents, they are abundant, inexpensive and safe. They also are easy to work with and recycle. But we also had to bear in mind that change within a craft will be slow."

Through FEMAP, Marquez met Juarez brickmaker Enrique Chavez, who agreed to help test his innovations. "Enrique was more open minded than many of the others, and initially was mocked by many of the same brickmakers who are now going to him for advice," Marquez said.

Marquez' kiln was designed and built in mid-1997, and the prototype was tested that winter. The advantages, both environmental and economic, were obvious.

"With a tandem kiln, one side functions as a filter, while the bricks in the other are protected from the elements," he said. "It's a cheap way of insuring the brick crop. In countries like India and Pakistan, the raw bricks lie exposed to the monsoon rains. In such situations, families have sold their children's labor to repay loans taken out due to bad weather."

As Marquez' work has progressed, other benefits have emerged.

"The soot can be recycled as fuel, and we also found that the covered kilns produce 10 to 100 times fewer particulates than the old uncovered ones," he said. The brickmakers also found that bricks now need only half as much wood to cook.

Last year, the International Joint Advisory Committee on Air Quality for the El Paso Del Norte airshed basin endorsed the continued development of Marquez' concept and design, and Mexico's top environmental officials have voiced their support. The Smithsonian Institution will highlight his research this summer as part of the Year 2000 Folklife Festival on the National Mall in Washington, D.C.

In Northern New Mexico, Marquez will help construct a similar kiln for Nambe Pueblo to make clay products for local use and sale. At Jemez Pueblo, he will help design a similar system that also will use the off heat to dry viga and latilla wood products when the funding becomes available.

Staudhammer's respect for his protégé is evident. "Robert has undertaken a complicated social interaction to produce a technology that impacts all areas of life," he said. "And his motives are completely altruistic."

The father of four sons, Marquez has received an armload of honors for his work. He was a 1999 recipient of a grant from the Lindbergh Foundation, for which he traveled to New York City to pick up.

With characteristic humility, he prefers to credit his success to his mentors and their institutions, including the Laboratory and the National Physical Sciences Consortium.

"I can only give thanks to those who have helped me contribute to humanity," he said. "With their help, I have learned not just science, but how to make science work."

After ...

Robert Marquez, left, Juarez brickmaker Enrique Chavez, middle, and Chavez' grandson cook bricks in a tandem kiln built from Marquez' design. The small amount of smoke produced by the kiln is only one of its advantages.

Letter from the Director:

Building on our legacies

Dear Employees,

With the year 2000 successfully underway, I want to share with you some of my thoughts about our Laboratory as we head into the 21st century. We should be proud of the accomplishments that this Laboratory has made over the past 57 years. We served this country well for a major portion of the 20th century. But we must look forward, not live on our past laurels, and build on those legacies that will serve us well in the future. I will not try to be a futurist in this letter and predict what the Lab will be like in 2050, but rather point out how we can build on our legacies while developing new characteristics to succeed as an institution. To me it boils down to mission, scientific approach to the mission, outstanding people, capabilities and facilities.

One of the legacies of the past 50 years has been a strong mission. We always have had a strong national security mission since our inception, and this has served both the nation and us well. We have a strong mission today to enhance global security by ensuring the safety and reliability of the U.S. nuclear stockpile and by helping reduce the dangers of the new and emerging threats, especially weapons of mass destruction. But at this point in time, one of the greatest challenges to this mission is our country's uncertainty about the appropriate national security posture for the upcoming decades. Our Cold War adversary, the Soviet Union, no longer exists. We're not sure where Russia is headed, although the recent elections would indicate that it is not back to a communist state. Russian leaders have stated that nuclear weapons are important to their present defense posture, and they also have not downsized their nuclear weapons complex as significantly as the United States has done. We also are not sure where China is going, although recent events indicate its desire to exert a strong regional presence. Regional conflicts remain a dangerous threat to global security in that they could quickly escalate beyond their region, especially if longer-range weapons or weapons of mass destruction are employed. While the Cold War is over, there still is considerable uncertainty for the United States when you consider the threats emerging across the globe from the Middle East through India, Pakistan and the Pacific Rim countries.

Many of these countries, as well as terrorist groups, either have or want to develop weapons of mass destruction. Proliferation of nuclear, chemical and biological weapons and the means to deliver them over long distances, namely ballistic or cruise missiles, could result in serious changes in world order. What this means for our programs in stockpile stewardship and in threat reduction is not totally clear, but I believe that the United States will continue to maintain a safe and reliable nuclear deterrent and will continue to develop new technology to address the emerging threats.

The way I see it, the role of nuclear deterrence is going to change, but not quickly or radically at first. It will change for several reasons. First, neither the United States nor Russia requires the massive arsenals of the Cold War to protect its interests. The number of Russian and U.S. strategic nuclear weapons most likely will be reduced in the next 10 years with more arms-control agreements between the two countries. Second, precision conventional weapons will grow in strategic importance as their effectiveness increases and as more countries acquire this capability. Third, there likely will be an increase in information warfare, because society is becoming so dependent on timely information. As we move toward a more multipolar situation, countries will use all means at their disposal, including information warfare, precision conventional weapons, nuclear weapons and other weapons of mass destruction, in order to have a presence as a regional and even global power. The United States will have to respond to this. And it will be part of our mission to help preserve peace in the world by providing deterrence against these new and emerging threats, especially weapons of mass destruction. Not all avenues to peace will be technological, of course. But as former Laboratory Director Norris Bradbury once said in regard to our mission, "We buy time for the politicians to solve their differences." I think this will be as true in the 21st century as it was when Bradbury uttered these words.

Laboratory Director John Browne

A second legacy from our first 50 years is the importance of science in solving complex problems. We always have pursued leading-edge science as our fundamental approach to meeting the needs of our country. I believe this approach will continue to be key to our success. But will the country continue to invest in this approach via the national laboratories?

You probably are asking yourself how we are going to do science when Congress takes actions like it did this year in cutting Laboratory Directed Research and Development. First, it is our plan to fight back against this cut, since I believe it was taken without thought of consequence. We have the support of the administration and many members of Congress for this type of exploratory research. Second, we must build more exploratory research into our programs. We must ensure that we have the best science underpinning not only the Stockpile Stewardship program, but also the threat-reduction programs and the energy and environmental programs. This is not easy, because many customers are shortsighted with respect to the importance of science; however, it still must be our approach. Third, we must compete to be valued members of the basic-science community through the quality of our proposals and through unique and important scientific facilities. This community includes the Department of Energy science programs, National Institutes of Health, National Science Foundation, National Aeronautics and Space Administration, etc.

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The United States has been the world's leader in high technology for the last 50 years, with much of this technology being created as a byproduct of the Cold War. This is no longer true. High-tech companies, producing products not directly related to defense (in particular information technology), drove the strong economy of the 1990s. Countries throughout the world are now hungry for and are developing high technology as part of their future. I believe that this trend will continue and will change how we in the United States approach national and global security. While I'm convinced that the United States will remain strong in this area, high technology is not going to be our sole province the way it was in the past.

Which brings me to some questions I've asked lately: Does the Laboratory have a major role in this technology revolution or are the national labs an anachronism? Why are we needed if high-tech companies are producing the new technologies that underlie the recent growth in wealth and much of the nonnuclear defense strategy of our country? Are we just going to be the high priests of a nuclear technology that no one wants but has to maintain because they don't know what else to do with it?

We were sustained through the Cold War because of the importance of nuclear deterrence to the balance of power with the Soviet Union. Although this country's leaders ignored nuclear weapons after the demise of the Soviet Union in 1991, the future role of nuclear deterrence is once again a visible issue as part of the aftermath to the Senate CTBT [Comprehensive Test Ban Treaty] debate. But does the country still really need us? I believe the answer to this question is going to end up driving our mission in the next 10 to 20 years. And we cannot simply wait for the answer but must develop the position that makes the country need us because of what we actually do to solve its important problems! I strongly believe that our scientific approach will be the key to providing the knowledge and the solutions the country will need to deal with complex problems in defense, energy, environment and health. I do not believe that these solutions will be provided by the short-term, profit-motivated companies that are building on the scientific accomplishments of the past.

Our third legacy is the importance of employing outstanding people. To contribute to the nation's security, Los Alamos must attract and retain the best and brightest people to develop and integrate leading-edge science and technology that *solves* problems of importance to national and global security in the broadest sense of the words. We will have to be flexible as individuals and as an institution and provide the country with innovative solutions. This is something I know you can relate to, because we at Los Alamos always have prided ourselves in being at the cutting edge of science. We know the things that really make a difference are those at the leading edge of science and technology.

Both what we do and how we do it will determine whether we are just another one of many labs or whether we are viewed as "the place to come." Chuck Vest, president of MIT [Massachusetts Institute of Technology], told me while visiting Los Alamos this summer that today's students are different than those in the past. They will go only where organizations provide the excitement of new technical challenges and the opportunity to solve them now. So attracting outstanding people to Los Alamos is a challenge we face. This is one of the reasons the events of the past year [the spying allegations and related fallout] are disconcerting. These events have put question marks in the minds of existing and potential employees about whether this Laboratory is going to be the kind of place they want to be associated with in the future. I believe today we have excellent people across the board at the Laboratory, but we live in competitive times. If people don't want to come here or to stay here, they have the opportunity to go some place else, since talent is in great demand.

So what do we do to address this? Collaborating with other organizations is something I believe will be even more essential than in the past, simply because people are more mobile than they used to be and choose to join organizations for different reasons. Consequently, the expertise we need is not all going to be captive inside Los Alamos like it was during much of the Cold War. Collaborations and partnerships will result in the best people supporting our mission.

Another important approach to attracting outstanding people is an increased level of interaction with the educational community, locally and nationally. Although our mission is not education, it will be critical for us to engage with postdocs, students, faculty and administrations of universities if we are going to have the close relationships that will result in attracting people to work with us. I believe that we can identify new ways to collaborate in areas such as modeling and simulation where students can take graduate courses locally from Laboratory "faculty" while having access to state-of-the-art computational resources.

Another major challenge I see for this Laboratory and other organizations is the increasing diversity in the workforce. We say the right things, and we try to do the right things, but I think we're going to have to become more aggressive at changing how we recreate ourselves in the workforce. All you have to do is walk around U.S. campuses today and see that the students represent women, minorities and other foreign nations as never before. More than 50 percent of the science and engineering students are coming from outside the United States. It's the same at the University of New Mexico as it is at Cal Tech, MIT or UC Santa Barbara. Companies are recognizing this, and they're paying big bucks because these employees represent the faces of the future. We're going to have to figure out what will attract a diverse workforce to Los Alamos. If it's not an environment they think is stimulating and one in which they feel welcome, they're not going to come. This is one of the reasons I am very concerned about the issues raised this past year with regard to foreign visitors to our Laboratory. It's going to be very important to

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this country that we engage scientifically with the rest of the world. However, we're going to have to demonstrate to the people of this country and to its leadership that we can continue to protect secrets while engaging with the external world.

It is imperative that we are good hosts to foreign scientists during their assignments at our Laboratory while also performing well in the areas of cyber-security, physical security and personnel security.

The whole concept of quality of life, both personal and work life, is a big issue. It's a given that people won't come here anymore just because we're Los Alamos. They *will* come if the work is challenging, if we are at the cutting edge, if we are collaborating with people on the outside and if we're forward-looking in terms of opportunities to have a life here — personal and professional — that is rewarding.

What are some of our distinguishing scientific and technical strengths? We have outstanding individuals in many scientific fields who are the equals of their best peers anywhere in the world. But our real strength emerges when we bring people together from these fields to solve complex problems of a scale that only a national lab can undertake. For example, we are developing the Supercomputing Complex Facility that will house initially a 30 teraop [10^{12} operations per second] and ultimately a 100 teraop computer for the most sophisticated simulations ever done. And we are developing leading edge visualization capabilities that will allow us to "see" the solutions. How we evolve beyond 100 teraops is not clear, but I have no doubt that new concepts for computing at a petaop [10^{15} operations per second] and beyond will be forthcoming. We intend to be part of that modeling and simulation revolution.

Another area I'm really excited about is the biosciences, which I think will have an important role in the future of the Laboratory. The world is closing in on sequencing the human genome in the coming year, several years ahead of schedule. But the excitement has just begun. Now the challenge will be to understand the next levels of complexity in structure and function of biological molecules and systems. As you know, the Laboratory recently formed a Biosciences (B) Division. This is a multidisciplinary division aimed at new initiatives that build on our expertise in biology, chemistry, physics and computational modeling. And while Los Alamos clearly is never going to be a biology laboratory, the bioscience effort will have tremendous payoffs for health, environment and defense against chemical and biological weapons, among other things.

There are many other areas of science and technology that I believe will contribute to the mission of the Laboratory now and in the future. Our initiatives in complex adaptive materials, quantum computing and space sciences are just a few examples. Dynamic 3-D radiography with protons and X-rays will provide us with new insights important for stockpile stewardship and perhaps other applications. Facilities such as DARHT, ATLAS, LANSCE and the National High Magnetic Field Laboratory will provide scientific results that support our mission and attract external scientists here as users.

The distinction between the sciences is not as clear as it once was — which further demonstrates the values of a large multidisciplinary institution like the Laboratory — and I don't see any one field of science dominating any more. Not everyone would agree with me, but I see physicists, chemists, engineers, mathematicians, biologists and maybe even social scientists coming together to study and solve very complex problems. Issues such as global warming will require more than just technical approaches to their solution, although scientific problems associated with carbon sequestration and nuclear energy could provide the Laboratory with the types of challenges that require our approach to problem solving.

There is another challenge before us I want to comment on, and that is running an institution with an aging infrastructure. I believe we have made progress in this area, but a lot of our infrastructure is still 50 years old. We have a new site plan that is designed to replace a lot of these aging facilities with new facilities. The new Supercomputing Complex is under construction, and the Nonproliferation and International Security Center will be next. We then would like to replace a lot of the older buildings, such as the Administration Building and the CMR Building. I would like to see our nuclear facilities consolidated into a nuclear materials complex so that we can provide outstanding capabilities while addressing safety and security in a cost-effective manner. I see our infrastructure as a big concern — I know that it can be frustrating to look back at the end of the year and realize you got very little research done because you were constantly fixing your building. We also need to find ways to ensure that our scientists and engineers have the latest equipment to do their research and development work.

The last thing I want to comment on is the University of California. UC has run Los Alamos since 1943, and I think it has been an outstanding organization for us to work for. It is the premiere public university system in the world, and it's going to continue to be that, in my opinion. There's a tremendous commitment within UC to sustain and grow its status. The university is adding a tenth campus at UC Merced, and the UC Riverside campus, which has been smaller than the others, is planning to grow by almost 50 percent to about 20,000 people in the next decade. When you're trying to maintain a first-rate scientific organization like Los Alamos, I believe that it is very, *very* important that a first-rate scientific university is running it.

At the same time, the university is working hard to demonstrate that it can manage large laboratories, and that's a challenge. It's a different world than it was in the past, but UC wants to meet the challenge. I think UC is going to be an important factor in what kind of laboratory we're going to be in the next 50 years. If we can sustain having an institution the quality of UC running the Laboratory, I think it's going to help us achieve our vision.

One of the things a lot of people say to me is "What is your vision — exactly what are we going to be in 10 or 20 years?" I don't have a crystal ball that shows exactly what the Lab is going to look like or exactly what we're going to be working on. There's never going to be a perfect road map from today into the 21st century. But if we solve important problems today, develop and support an outstanding and flexible workforce, improve our physical plant, build strategic partnerships with universities and industry and stay true to our scientific heritage, I believe that we will be prepared for anything the future brings.

So what do I want for the Laboratory in the next century? I want Los Alamos to be a scientific institution to which the country turns to solve problems of national and global importance, an institution the American public values and trusts, a good neighbor to local communities and an exciting and vibrant place to work. With your help, all these things are possible.

Leaders named for Solid Waste Operations

Ray Hahn

Ray Hahn recently was selected as leader of Solid Waste Operations (SWO) in the Facilities and Waste Management (FWO) Division.

"Ray has more than 30 years of managerial, supervisory and technical experience in radioactive waste and hazardous materials programs," said Tony Stanford, FWO Division leader. "We are pleased to have him as part of our team."

John Kelly

Stanford also praised the recent selection of **John Kelly** as deputy leader of the group, saying he brings extensive technical leadership experience to the organization and will "work closely with SWO group management and team leaders to provide strong leadership in Solid Waste Operations."

Hahn came to the Laboratory after working for Envirocare of Utah/ Zhagrus Environmental, where he was commercial technical support manager. Before that, he worked at WASTREN Inc. of Germantown, Md., as a subject matter expert in hazardous materials transportation and hazardous, radioactive and mixed-waste management. At WASTREN, Hahn provided support to the Department of Energy's Office of Environmental Health and Safety.

Kelly, who has been with the Laboratory for nearly five years, had been team leader for Hazardous Waste Operations within SWO.

Laboratory retiree collaborates on new book

Terry Foxx

Laboratory retiree **Terry Foxx** of Ecology (ESH-20) has recently published a new book in collaboration with **Timothy Haarman** and **David Keller,** both of ESH-20.

"Amphibians and Reptiles of Los Alamos County" is the title of the new book Foxx, Haarman and Keller have been working on for approximately 10 years. Foxx designed most of the drawings for the publication and about 50 percent of the photography. She retired Dec. 1, 1999.

Foxx received a master of science degree in biology from Kansas State

continued on Page 11

December employee service anniversaries

30 years
Bennie Gomez, NMT-3
Carlos Montoya, ESA-WE
Larry Reese, NMT-8

25 years
Ernest Gladney, ESH-17
Kathleen Holian, CIC-12
Marlene Lujan, CIC-14
Mary Luke, DX-3
Jimmy Melton, DX-8
Shirley O'Rourke, BUS-4
Annette Roberts, HR-7
Kathleen Romero, NMT-4
Donna Sanchez, FWO-FDS
Weldon Scoggins, CIC-6
Gary Seals, BUS-5
Walter Stark Jr., NMT-11
Eduardo Viramontes, DX-4

20 years
John Eddleman, LANSCE-7
Deborah Garcia, TSA-DO
Louella Lopez, BUS-5
Michelle Melton, HR-5
Harry Plannerer, EES-5
Cheryl Roybal, CIC-18

15 years
Grace Casados, BUS-2
James Cobble, P-24
Patrick Foy, CST-11
Betty Ann Gunther, CIC-15
Arlin Gurley, NIS-FMU-75
Mary Jolene Hatler, NMT-2
Alexandra Heath, X-5
Cheryl Host, CIC-5
D. Lynn Kluegel, CIC-5
Loren Lundquist, X-4
Graham Mark, CIC-12
Martin Martinez, LANSCE-6
Debra McInroy, BUS-3
Gabriel Ortiz, CIC-2
Robert Patterson, FWO-CTM
Gerald Reisz, CIC-12
Sharon Smith, CIC-14
Sharolyn Tafoya, HR-5
Royce Taylor, ESA-WMM
Sheena Wadlinger, P-25
Gary Webb, S-5

10 years
Anna Lisa Adkins, BUS-1
Thomas Bell, MST-8
Jesse Castanon, BUS-5
Shuh-Rong Chen, MST-8
Juan Corpion, NMT-DO
Rita Lucille Galvan, DX-3
Charles Graham, LANSCE-FM
Ware Hartwell, E-DIV
James Kennedy, DX-1
Lynne Kroggel, ESH-OIO
Gerald Myers, B-1
John Musgrave, CST-11
J. David Olivas, NMT-11
Lesley Roybal, BUS-4
Yvette Valdez, NMT-3
Mahlon Wilson, MST-11

5 years
Denise Archuleta, X-6
Stephen Black, ESA-TSE
Camille Bustamante, ESH-13
Benino Casados, ESA-MT
Mary Cernicek, NIS-RNP
Dennis Duran, ESH-1
Anne Elliott, FWO-WFM
Shirley Fillas, ESH-13
Joanna Foster, LC-BPL
Claude Gallegos, ESH-1
James Gallegos, NMT-11
Tom Garrison, EES-5
Robert Gentzlinger, ESA-DE
Judith Huchton, ESA-FM-ESH
John Lestone, NIS-5
Leland Maez, ESH-17
Ellena Martinez, E-ER
Barbara McNamara, ALDNW
Carmela Romero, ESH-10
Maco Stewart, CIC-1
John St. Ledger, TSA-3
Steven Story, ESH-17
Cetin Unal, TSA-10
Laura Vanderberg, B-2
Diana West, ESA-TSE
Mark Wingard, CIC-2

In Memoriam

Patricia Burns Dietz

Laboratory retiree Patricia Burns Dietz died Nov. 25. She was 65. She was a graduate of St. Luke's Hospital School of Nursing in New York. After 30 years in nursing, she left the profession and joined the Lab in 1981 as records keeper II with the former Electron History (P-14) group. Dietz, a licensed commercial airplane pilot, flew air charters part-time in her own plane and for the airport operator in Santa Fe. She also flew competitively in her plane and other sponsored aircraft. She competed in the All-Women's Continental Air Race (The Powder Puff Derby) from Monte Rey, Calif., to Philadelphia and in the All-Women's International Air Race (The Angel Derby) to Managua, Nicaragua. Dietz retired as an administrative assistant in 1988 while working in Computing and Communications (C) Division. She came back to work part time in C Division until 1992.

"Science at Home" is a publication developed by Science Education (STB-SE) to interest children, particularly those in grades four through eight, in science through hands-on activities. We are reprinting experiments from the book, along with other scientific activities, for employees to share with their families or just to enjoy themselves.

Windowsill greenhouse

Imagine a place where the sun shines 24 hours a day, yet the average temperature never gets above freezing. It's a place where it never rains, and the climate is so dry that it ranks as the world's biggest desert. It's a place with an environment so hostile, that the only land animal is a type of fly and the only native plants are lichens. The place is Antarctica, the continent at Earth's south pole. It's a perfect place to start growing tomatoes, squash and maybe even mangos. Tropical fruits in Antarctica? The idea isn't as wild as it seems using a new type of greenhouse. Scientists have been experimenting with indoor environments that can maintain near tropical conditions, even in the harsh Antarctic climate.

Greenhouses are not new inventions. Their original designs date back to the 1600s. However, because glass was very expensive in the early days, they were usually only enjoyed by people of great wealth. Over the years, greenhouse designs evolved as the availability of glass increased. Today, many modern greenhouses don't even have glass, but use new space-age lightweight plastics that capture light energy and control heat loss. Today's greenhouse is more like a self contained bio-shelter that in the future might even allow humans to live comfortably on Mars.

If you're interested in trying your hand at greenhouse gardening, but you don't want to take a trip to Mars or Antarctica, you're in luck. All you need is a window sill, three old plastic soda bottles and some patience. (Oh, a green thumb doesn't hurt either.) In this activity, you will construct a mini greenhouse in which you will plant a variety of seeds, observe them as they grow and compare the effects of two controlled environments.

The stuff you'll need

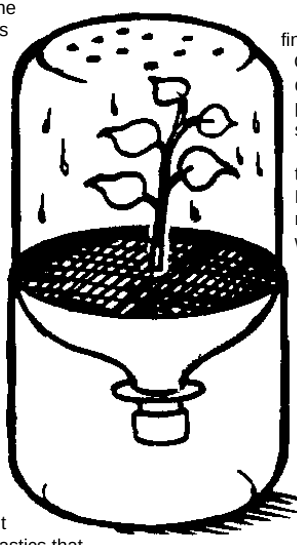
Three 1-liter clear plastic soda bottles; two rocks slightly larger than the mouth of the bottle; a few small rocks for each bottle; 2 to 3 cups potting soil or dirt; at least three different kinds of seeds (flowers, beans, popcorn, sunflower, etc.); a sharp knife or pair of scissors; an ice pick or nail; six toothpicks; masking tape; two small plastic outdoor thermometers.

Here's the plan

1. Take the labels off the soda bottles. They will come off easily if you fill the bottles with hot water from the tap.

2. Cut the tops off the three bottles about 1/2 inch below the rounded shoulder (diagram 1).

3. Turn the tops of two of the bottles upside down and push them into the bottom parts until they are snug (diagram 2). Tape the sides together.



4. Place a rock in the opening of the two bottles, big enough to keep soil from falling through. Put a few of the smaller rocks on top of the big rock to provide drainage.

5. Cover the rocks with soil almost up to the top of the bottle.

6. Write the name of each seed on individual pieces of masking tape. Wrap the tape around a toothpick to make a flag (diagram 3). Make two flags for each seed.

7. Look at and compare the seeds you are using. Describe what they look like, their size and what they feel like.

8. Dig some holes with your finger and plant your seeds in the soil. Cover them up with soil and slowly drip water on them. Use the toothpick flags to mark where each seed is planted.

9. Insert one of the thermometers into the soil of each bottle. Make sure that the bulb of the thermometer is completely covered with soil.

10. Cut a 1/2 inch slit in the edge of the bottom of the third bottle. Using the ice pick or nail, poke several air holes around the closed end of the bottle (diagram 4).

11. Turn the bottom part of the third bottle upside down and push it onto the top of one of the planters to make a greenhouse cover (diagram 5).

12. Now you have two kinds of planters. One is open to the air. The other one is a mini-greenhouse with a clear cover that will let light in, but will keep heat and moisture from getting out.

13. Record the temperature on each thermometer on the data sheet. They should be about the same. Place the planters next to each other on a windowsill in direct sunlight. Leave them for 20 minutes.

14. After 20 minutes, record the temperatures. Was there any change? Continue to monitor the temperature of each thermometer for 40 more minutes, recording the temperature every five minutes. Is there any major difference between the temperature in the two planters? Graph your results to see if there is a trend.

15. Place your planters somewhere out of the sun, but in a fairly warm area until they sprout. Make sure you add a little more water to the open planter to make up for any lost to evaporation. When the seeds sprout, put them in a window sill to get more light, but direct sun may still be too hot for them. Check them for soil moisture each day and continue to monitor the thermometers. If the soil feels dry, give them a little water. Which one needs more watering? Why do you think one needs more water than the other?

16. Compare the growth and draw a picture of the plants in each planter daily. How tall are they? Do plants from big or small seeds seem to grow faster and bigger? Which plants grow better in the green house? Which grow better in the open planter? What other comparisons can you make? What advantages do greenhouses have for farmers who want to get an early start in spring planting?

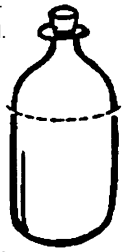


diagram 1

diagram 2

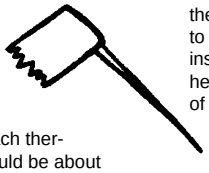


diagram 3

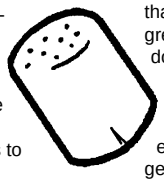


diagram 4

diagram 5

Wrap-up

Even though the temperature of the soil in the two planters started out about the same, the temperature in the mini-greenhouse should have risen more quickly and reached a higher peak than the open air planter. The open air planter will have dried out more often due to evaporation, while the mini-greenhouse stays moist longer. You should see little drops of moisture in the greenhouse. These drops are water that has evaporated from the soil and have condensed back to water. This helps to keep the greenhouse soil moist. By starting their seedlings in greenhouses, farmers can get their plants to grow much earlier in the spring. The performance of individual plants will vary, but in general, the greenhouse plants should grow faster and bigger.

What's going on here?

Greenhouses work because of the way light acts as it passes through a transparent medium, like glass. Visible light, the light we see that comes from the sun or a lamp, is actually only a very small part of the light energy. Technically speaking, the broad band of energy that includes visible light is called the electromagnetic spectrum and includes X-rays, radio waves, gamma rays, microwaves and heat waves, which we call infrared.

When light goes through glass, something unusual happens. Visible light can pass right through glass without losing much energy at all. Heat, or infrared radiation has a hard time making it through glass, though. Glass acts like an insulating barrier, trapping the heat behind it. Greenhouses put this principle to use very effectively. With all the exposed glass, greenhouses take in a tremendous amount of visible light, which is absorbed by the plants, soil, water and rock inside. Some of this light energy is then re-radiated back into the greenhouse as infrared or heat energy. When the infrared hits the glass roof of the greenhouse, it can't pass through to the outside, so it stays trapped, warming the air inside. Some greenhouses are so effective at trapping heat, that they often have to be vented in the middle of winter so that the plants won't die from overheating.

Where does this happen in real life?

The greenhouse effect is being used for more than just growing plants. Many people are building greenhouses as a part of their home in order to cut down on heating bills. The solar heat trapped by a greenhouse can help heat the rest of the house, which in the right climate could amount to savings of thousands of dollars each year. Many people experience the greenhouse effect every time they get into a closed car on a sunny day. Since most cars have an abundant amount of glass, visible light gets in, is absorbed by the interior and re-radiated out as heat.

The one place where we hear about the greenhouse effect these days is in Earth's own atmosphere. It turns out that glass isn't the only thing that traps infrared radiation. Certain gases like carbon dioxide and methane do too. Many scientists are concerned that as the concentration of these gases increases in the atmosphere due to the burning of fossil fuels, the temperature of the planet will steadily increase. This so-called global warming would not only increase the stresses on living things directly, but even a slight increase in temperature would cause a significant amount of the polar ice caps to melt.

This month in history

February

1869 — Mendeleev completes his first periodic table of the elements

1880 — The Atchison, Topeka and Santa Fe railway reaches Santa Fe by a spur from the main line at Lamy

1908 — Sheriff Pat Garrett, the man who shot Billy the Kid, is shot and killed while riding out to inspect land near Las Cruces

1923 — A fire in Mine No. 1 of the Stage Canyon Mine near Raton kills 125 miners

1935 — The board game Monopoly, invented by Charles Darrow, is first marketed

1943 — Groundbreaking is held for the first unit of the Y-12 plant at Oak Ridge

1944 — U.S. Marines raise the flag at Iwo Jima

1949 — The Mesa Public Library moves from its location on Trinity Drive to the old Central Cafeteria Building on Central Avenue

1962 — Francis Gary Powers, a U-2 reconnaissance plane pilot, is returned to the United States in exchange for Soviet spy Rudolf Abel

1970 — Astronaut Alan Shepard golfs on the moon

1987 — Supernova 1987A is first detected at an observatory in Chile

1998 — President Bill Clinton visits the Laboratory, touring computing facilities and addressing employees

Syndicated Material

Removed at the request of the syndicate

Syndicated Material

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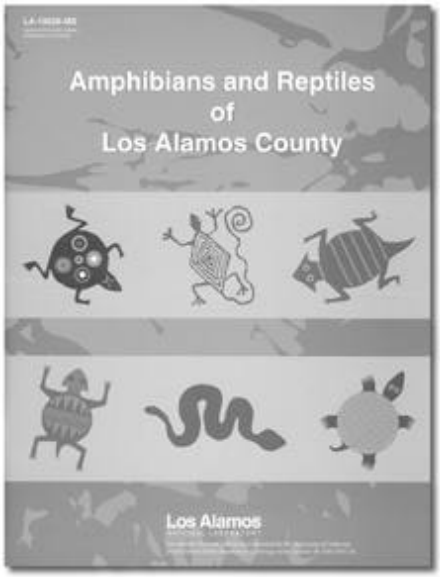
Lab retiree ...

continued from Page 9

University in 1965. She came to work for the Lab as a consultant in 1977 working with endangered species surveys of plants for the Environmental Impact Statement of 1979. She worked as a consultant and collaborator until 1986. From 1989 to 1994, Foxx worked in various capacities and became acting group leader of ESH-20. From 1995 to 1999, she was project manager for the Threatened and Endangered Species Habitat Management Plan.



One of Foxx's major publications is a three-part series, "Status of the Flora of the Los Alamos National Environmental Research Park," which won an award from the Technical Writers Association.

Other publications are, "Old Field Succession on the Pajarito Plateau," "Annotated Checklist and Database for Vascular Plants of the Jemez Mountains" and "Historical Botany of the Romero Cabin: A Family Homestead on the Pajarito Plateau" with co-author Gail Tierney.

In addition to these publications Foxx has written a book called "Flowering Plants of the Southwestern Woodlands" with Dorothy Hoard.

The Eagle will fly again

by Ternel Martinez

If at first you don't succeed …

This pretty much sums up the attitude of several undergraduate students who work at the Laboratory and their colleagues from Northern New Mexico Community College in Española, in light of their recent experience in Sunrayce.

Sunrayce is the nation's largest intercollegiate solar car racing event and is designed to promote and celebrate excellence in engineering, math and science. The most recent race was held last June and covered 1,425 miles, starting in Washington, D.C., and ending at Disneyworld's Epcot Center in Orlando, Fla. The Department of Energy co-sponsors the event.

Donna House, right, an Engineering Club adviser/volunteer and solar-car instructor at Northern New Mexico Community College; Larry Rodriguez, center, of Polymers and Coatings (MST-7); and Engineering Club President Andy Martinez display the solar car El Aguila in the campus parking lot. Team Sunrayce hopes to further refine the car and have it ready for the next Sunrayce competition, scheduled for 2001.
Photo by Leroy N. Sanchez

Among the would-be entrants was a teardrop-shaped car with the number 505 proudly displayed on its side and given the name "El Aguila" (The Eagle). The NNMCC Sunrayce Team's crew included three Lab employees: Antonio Alberto, Larry Rodriguez and Louis Fernandez. Four other Lab employees also helped construct the car.

The Eagle is 19 feet, 4 inches long, is 4 feet, 2 inches high and weighs a mere 873 pounds. To save on expenses, the team constructed the car using lightweight materials, such as aluminum tubing, Lexan (a special polyester used as a hardened plastic) and Styrofoam reinforced with fiberglass and epoxy.

The team received financial contributions and in-kind services totaling more than $100,000 from a variety of local businesses and individuals — even from two businesses in New York City and Seattle — to pay for materials and traveling expenses. Donna House, an NNMCC Engineering Club adviser/volunteer and solar-car instructor, coordinated the fund-raising drive.

"The students' efforts impressed people and demonstrated that students from 'the Valley' can do this kind of enterprise. It's these examples of students' efforts that break the negative education stereotypes of the Española area." said House.

One day, the team discovered it had to make the solar panels smaller to stay within maximum length/width limits, said Alberto. The redesigning effort took about two weeks, taking away additional testing time. That ultimately would come back to haunt them.

The Eagle had to pass two phases before being considered worthy of entering the race. The "scrutineering" phase comprised a battery of more than 30 car-safety tests, such as making sure the drivers could adequately see from inside their cars and that the rolling cage could sufficiently protect drivers in case of accidents. The Eagle passed this phase without any problem.

The more intense qualifying phase involved racing the Eagle around a race track 124 laps for speed and reliability. For safety reasons, only the top 40 qualifiers would get to race.

Rodriguez drove the car for the team. One lap, two laps, three laps … so far, so good.

Then, the dream ended abruptly on lap 15, when the car just "died" on the track. No power, no anything. It was over.

"The batteries just stopped charging," Alberto recalled. "I guess we pretty much beat the hell out of those batteries too much." In retrospect, had the team had the two testing weeks it lost earlier due to the solar panels, it may have been able to avoid this problem, he added.

"We just wanted to finish the race and see the fruits of our labor. We didn't care whether we won."

"We may not have qualified for Sunrayce '99, but the team attained a higher level of success than some professional engineers or students by designing and constructing a functional solar car. I'm so proud of them," said House.

Alberto and his colleagues already are modifying the car's design and are planning to enter Sunrayce 2001. Some plan to attend Sunrayce's workshop on electrical design next year.

As Alberto put it, "I don't care what it takes, that car's gonna race! No way are we giving up!"

Lab employees on official Team Sunrayce

- *Antonio Alberto, RF Accelerator Technology (LANSCE-5), solar array team leader*
- *Larry Rodriguez, Polymers and Coatings (MST-7), mechanical team leader*
- *Louis Fernandez, Emergency Management and Response (S-8), electrical system team leader*

Lab employees who helped construct El Aguila

- *Daniel Begay, Plasma Physics (P-24)*
- *Dominic Pompeo, Health Physics Operations (ESH-1)*
- *Brenda Trujillo, Communication Arts and Services (CIC-1)*
- *Martin Parrales, Safeguards Science and Technology (NIS-5)*

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