Reflections

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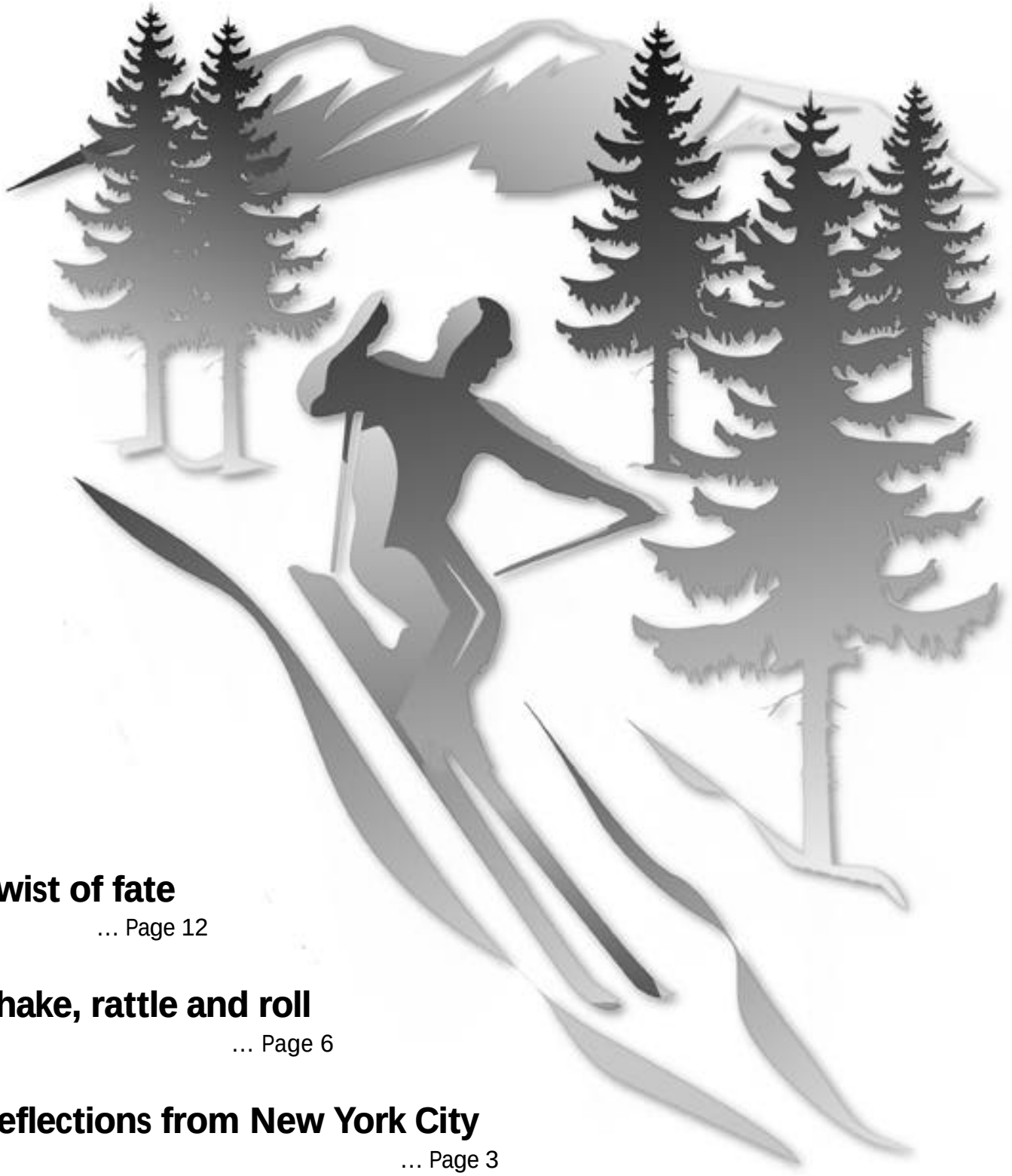

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Cover by Edwin Vigil

Reflections

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editor's journal

A vow to unclutter

January. No matter how deep the snow, cold the air or short the days, I like this month.

There's something spirit-lifting about starting a new year. January is the one month we are allowed, even expected, to admit that we weren't so perfect during the past year and to vow that we will be better, or at least different, in the new one.

I'm not much on making resolutions, but each new year I promise myself that I will try to be a better person in some fashion. This year, I've made only one promise for the workplace, but for me it's a biggie. I've promised to try really, really hard to keep my desk uncluttered — that is, once I get it cleared off.

On the surface this seems like a simple promise, but those who have seen my desk know I have a formidable task before me. I truly marvel at people who keep their desks free of stacks of papers, scribbled notes, empty cups, books, files, junk mail and just plain "stuff." I don't seem to have that gift.

Photo by Edwin Vigil

I've gotten to the point where I cringe when I walk past my office mailbox because I know there's more stuff in it. More stuff that I don't have time to look at but am afraid not to read, less I miss something important. So, I collect the new stuff and add it to the mound on my desk, weeding through it a little each day when I find the time until the pile disappears, only to be replaced by a new one.

I haven't figured out just how I'm going to keep the clutter down on my desk — that's a lot easier said than done — but I do know I need more order in my work life. So I'm going to try. In fact, I think trying to be or do better is what New Year's resolutions are really all about. And rumor has it, I'm not the only one at the Lab who follows this tradition.

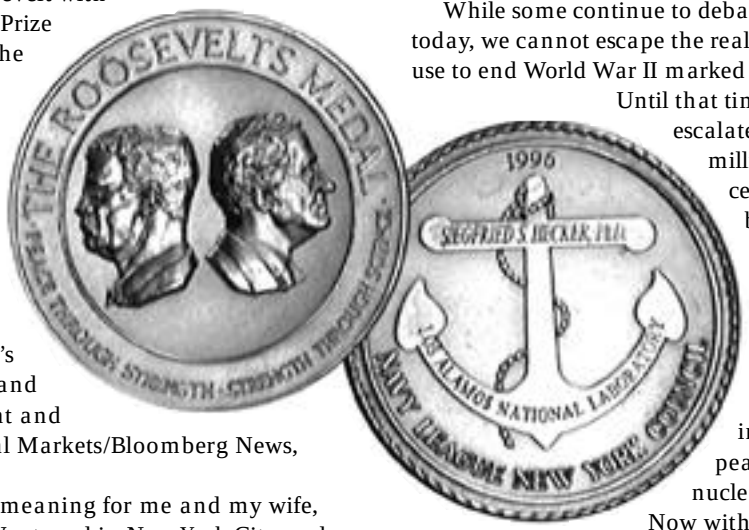
Whether you made any resolutions or not, here's to a bright new year. And may we never stop trying. Who knows, I actually may cut my desk clutter in half.

New York City reflections

by Sig Hecker

In the spirit of reflections, I had the opportunity to revisit New York City almost exactly 40 years after my family got off the boat at New York Harbor in December 1956 after our journey to the United States.

The occasion for this visit was the Navy League dinner at which I received the Theodore and Franklin D. Roosevelt Gold Medal for Science Award. The Navy League of the United States was founded by Theodore Roosevelt with proceeds from his Nobel Peace Prize in 1906 for his role in settling the Sino-Japanese War. It is an organization with chapters around the world supporting the Navy and its maritime activities.



It was a great honor to be recognized along with Harry C. Stonecipher, chief executive officer of McDonnell Douglas Corp., who received the League's Leadership Medal for Industry and Michael R. Bloomberg, President and Founder of Bloomberg Financial Markets/Bloomberg News, who received the Media Medal.

This visit had a very special meaning for me and my wife, Nina, who accompanied me. We stayed in New York City and visited the Statue of Liberty and Ellis Island. The refurbished statue is impressive, including the 354 steps that lead you inside her crown. To me it brought back memories of Dec. 19, 1956, when my family and I first sailed by before disembarking in New York Harbor.

Ellis Island served as the principal immigration depot in the United States from 1892 until 1954. Some 12 million people landed there to be processed. Today, their descendants account for nearly 40 percent of the United States' population.

Nina passed through the Great Hall on Ellis Island with her parents in November 1950, on their way from war-ravished Poland, by way of Germany (where Nina was born right after the war). They were on the way to a new life of hope in Cleveland, Ohio, where we first met six years later when I moved in next door after my arrival from Austria via New York Harbor. I did not come through Ellis Island, which closed Nov. 29, 1954.

Today, Ellis Island has been restored to its original condition; a strong symbol of America's immigration heritage. Together with the Statue of Liberty, it is one of the greatest reminders of the promise of liberty and opportunity that the United States offers to the people who pass through its gates.

The following is the text of my acceptance remarks at the Navy League, New York Council, dinner.

Ladies and gentlemen, distinguished guests and honorees. I am proud to accept this award on behalf of the men and women of one of the greatest scientific institutions in the world, the Los Alamos National Laboratory, operated by the University of California for the Department of Energy.

It is the creativity of our people, their dedication, and their loyalty to this great nation that allows me to stand here tonight to accept this prestigious award. Receiving this award from the Navy League is very special to me because: a) the Navy and Los Alamos have been partners for over 20 years in developing and maintaining the nuclear deterrent of our Trident submarines; b) the Navy League's credo, Peace through Strength and Strength through Science, also describes the heart and soul of the Los Alamos National Laboratory.

While some continue to debate the need for nuclear weapons today, we cannot escape the reality that their development and use to end World War II marked a discontinuity in world affairs. Until that time the death toll due to war had escalated unabated, with more than 80 million dead in the first half of this century alone. That trend was broken in 1945 and we have not witnessed a global confrontation during the ensuing 50 years. During the Cold War, the men and women of Los Alamos, working side by side with our colleagues in the Services, helped provide peace through the strength of our nuclear deterrent.

Now with the Cold War at an end, we are working together to reduce the size of the nuclear arsenals, while guarding against a resurgence of global war. The President has charged us to keep those weapons required for deterrence safe, secure, and reliable — without nuclear testing and without replacing them with new models. This is a most difficult challenge. Indeed it is a challenge that can be met only by a renewed emphasis on science.

We are also working with our former adversaries, the Russian nuclear weapons laboratories, to reduce the danger represented by the proliferation of weapons of mass destruction. And, we are working with our scientific colleagues around the nation to deal with the legacy of 50-plus years of nuclear weapons production.

These jobs cannot be done without an investment in science — in our universities, our laboratories, and in industry. I applaud the Navy and the Navy League for their support for science and their investment in the future of our nation.

On a very personal note, being honored in New York with a medal carrying the profiles of two great presidents is a most special honor. For it was almost exactly 40 years ago that I arrived in New York Harbor as a 13-year old immigrant on the converted warship, the USS General Langfitt. The people of this country embraced me, they placed their trust in me — granting me citizenship, security clearances, and then the directorship of the Los Alamos National Laboratory. I am proud to be able to serve this great country of ours.

Let me close by also thanking my wife, who is here with me tonight, and my four daughters for their strong support and understanding over the years. I could not have succeeded without them.

cio report

The Good Neighbor Program

This report was submitted by the Community Involvement and Outreach (CIO) Office. If your organization wishes to submit an item, please call us.

Do you do volunteer work in your community? Are you on your school board, the volunteer fire department or the county commission? Are you active at your church, a civic group or your children's school? The Community Involvement and Outreach (CIO) Office — and the Laboratory — needs your help.

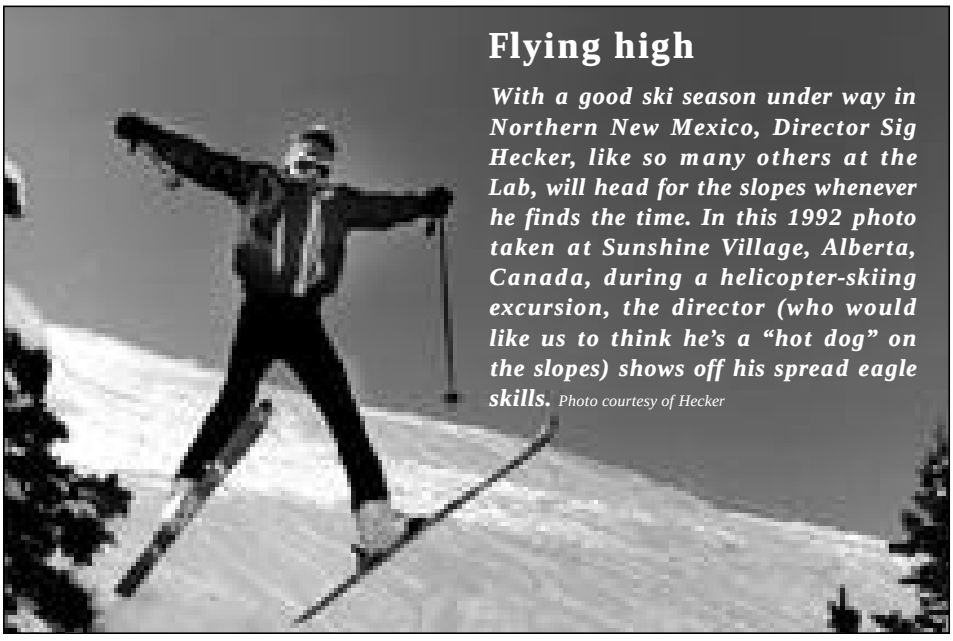
The Good Neighbor Program is a proposed CIO initiative that would identify Laboratory employees who are currently involved in the activities of their communities and bring them together on a periodic basis to meet with Lab managers and CIO staff. The meetings would provide an opportunity for these "good neighbors" to raise Lab-related issues of interest in their communities and allow Lab management to share information that may be of interest in the area.

This kind of forum has been requested by community groups, employees and management, and it responds to the finding in the Lab's annual public opinion survey that showed that the public wants more information about the Laboratory and greater input into decisions that may affect them and their communities.

The program is designed to provide another avenue for the Lab to listen to community concerns and inform neighboring communities about Lab programs and other activities. Many employees already help out in their communities, and this program can piggy-back on these efforts to make the Lab more aware of, and responsive to, community concerns.

"Good neighbors" will be a diverse group of employees who are already active in their communities and who want to make a difference in the relationship between the Lab and Northern New Mexico. The GNP will focus on informal person-to-person communication to increase dialogue with all people and organizations affected by the Lab's programs.

The GNP is scheduled to be piloted in the spring, and details of the implementation are being worked out now. If you are active in community organizations and would like more information about the Good Neighbor Program, call Chuck Pacheco of Outreach and Involvement (CIO-1) at 7-1217 or send e-mail to *cpacheco@lanl.gov*.

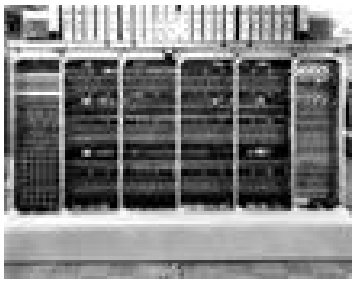


Flying high

With a good ski season under way in Northern New Mexico, Director Sig Hecker, like so many others at the Lab, will head for the slopes whenever he finds the time. In this 1992 photo taken at Sunshine Village, Alberta, Canada, during a helicopter-skiing excursion, the director (who would like us to think he's a "hot dog" on the slopes) shows off his spread eagle skills. *Photo courtesy of Hecker*

Did you know...

• The MANIAC I computer built in Los Alamos in 1952 performed about 1,000 instructions in one second. Present-day supercomputers at the Lab perform over 1,000,000,000 instructions per second per processor.



Doing business with the Lab

by Ternel Martinez

Laboratory outreach. These two words can have several different meanings. For some, Laboratory outreach means the Lab's participation in, or sponsoring of, community events. For others, it means improving communication channels with Northern New Mexico communities, allowing them to be better informed of Lab activities.

Still others believe that Laboratory outreach means doing more to ensure better job and procurement opportunities at the Lab for the neighboring communities' citizens.

Regardless of the definition, one might think there aren't many ways the Lab's Small Business Office in the Business Operations (BUS) Division can do much in Laboratory outreach. But Small Business Program Manager Celso Archuleta said the office has proven otherwise.

"We have been doing so much lately, with the full support of Lab senior management, to really help Northern New Mexico communities do business with the Lab," said Archuleta, who made it clear that the combined cooperative efforts of the Lab's buying staff, end users, the small business community and his staff are responsible for making the office's outreach efforts as successful as they have been.

Many small businesses in Northern New Mexico benefit from doing business with the Laboratory, such as the companies shown here that provide machining service, laundry service, computers, signs, and sheds and trailers. *Photo illustration by Fred Rick and Edwin Vigil*

In fact, the Laboratory recently received another outstanding rating from the U.S. Small Business Administration for its Small Business, Small Disadvantaged and Women-owned Small Business Subcontracting Program. The award is one of several awards the Laboratory has received from the SBA, the Department of Energy and other agencies over the years.

Archuleta cited several examples of his office's outreach efforts, including the creation of a Small Business Database, which helps small businesses identify Lab buyers and end users and the products or services they normally buy. Additionally, the database lists small businesses and the products and services they provide.

Celso said the office also holds quarterly vendor training workshops in various communities throughout the region. "We train the vendors on how to fill out requests for proposals. We also hold marketing classes so they'll know how to do business with the Lab," he said.

If a small business owner still is unsure about how the procurement process works at the Lab, the office offers one-on-one consulting services. The consulting can take place either at the Lab or at the business owner's site.

What if a business owner wants to do business with the Lab but is unsure of whether the business is even qualified to do so? The SBO covered that scenario as well.

Through an agreement with a nonprofit organization called Industrial Network Corp., the SBO can arrange for INC to evaluate a person's business, determine its strong and weak points and make suggestions on how to improve in the weak areas.

"The best thing about this service is that INC and the Lab split the cost of the evaluation. The owners don't have to pay anything," said Archuleta. He added the Lab also does onsite tours of Northern New Mexico businesses.

Of all the outreach efforts that the Small Business Office takes part in, however, Archuleta is most proud of the Lab's participation in a relatively new organization called the Northern New Mexico Procurement Advisory Board, comprised of representatives from the Lab and the Los Alamos, Santa Fe and Española chambers of commerce.

"The representatives go directly to their respective business communities and listen to their needs and concerns. They then relay that information to the full board. The Lab would then try to create regional purchasing strategies to accommodate the communities' needs and assist in economic development," he explained.

Archuleta said all of these outreach efforts already have paid off over the past two fiscal years. For example, the Lab exceeded its socioeconomic goals for fiscal year 1996. And in fiscal year 1995, the Lab spent about $55.2 million procurement dollars with small businesses in Northern New Mexico; that figure increased to about $67 million last fiscal year, despite a reduced budget.

In addition, while the office normally sets overall goals with DOE and the University of California in terms of small business procurement operations each fiscal year, Archuleta said specific goals and metrics on how the Lab fares in Northern New Mexico will be created this year. These goals will be incorporated for the first time into the UC contract, he added.

Shake, rattle and roll

by Steve Sandoval

Phylise Stahm remembers well the 1965 Seattle earthquake. She was living in this now-trendy Pacific Northwest city and working at the Seattle Center at the World's Fair.

"The quake was really absorbed by the waters on both sides of Seattle. King County got the brunt of it," Stahm recalled. "All it did where we were, all that affected us was the dishes falling off the shelves," she said. "I didn't really know much about it until I got downtown."

Twelve years later Stahm was teaching in Panama when the aftershocks of an earthquake in Guatemala were felt. "I knew what the second one was. We were supposed to go stand in a doorway but we ran into the street," said Stahm.

Now, three decades later, she's a teacher at Aspen and Mountain elementary schools in Los Alamos, where earthquakes aren't as prevalent.

Stahm was one of 40 teachers from throughout New Mexico who participated in an earthquake preparedness workshop the Lab's Earth and Environmental Sciences (EES) Division and Science Education and Outreach (SEO) Group of the Human Resources (HR) Division hosted in conjunction with the Federal Emergency Management Agency, the state Department of Public Safety and the state Bureau of Mines and Mineral Resources.

The workshop, according to Dolores Jacobs of SEO, was designed to help educators from throughout Northern New Mexico, and other government employees, learn about the elements that give rise to earthquakes, how the earth's physical structure changes and contributes to earthquakes, damage caused and some safety tips on how to mitigate damage.

"Los Alamos and this whole area is very earthquake prone," Jacobs said, noting that the workshop included field trips to observe faults and fault lines, and a skit in which teachers lived through a "simulated earthquake."

In fact, FEMA classifies New Mexico as a "moderate risk" state for earthquakes. "Along the whole Rio Grande Rift there are a lot of faults," said Bob Redden, the state's earthquake preparedness manager at the Department of Public Safety. "We've had earthquakes in the past in New Mexico, and we probably will in the future."

New Mexico is classified as moderate risk, said Redden, because of the long recurrence between earthquakes, and their magnitude.

He noted that the largest magnitude earthquake in the state's recent history occurred in 1906 near Socorro; it was recorded as a 6 on the Richter scale, a logarithmic scale in which a quake of magnitude 6 is 10 times as large as a quake that measures 5 and 100 times as large as one that registers 4. In 1918, a quake with a magnitude of about 5.5 occurred in the Cerrillos area. And in 1966, a magnitude 5.7 quake was recorded in Dulce, causing heavy damage to several buildings. The quake that rattled Stahm in Seattle registered 6.5.

Earl mo mot seis Bra

During the workshop, teachers used a curriculum FEMA developed on earthquake awareness and preparedness. Called "Tremor Troop," it is designed for kindergarten through sixth-grade students; the FEMA curriculum guide for grade seven through 12 students is called "Seismic Sleuth."

The curriculum contains educational activities to help students understand some fundamentals about earth sciences, geological conditions underlying an earthquake, the physical effects to the earth, faults and fault lines, and how to measure earthquakes using the Mercalli and Richter scales.

The Mercalli scale measures an earthquake's intensity of groundshaking as felt at a particular location. The Richter scale measures the energy released by an earthquake.

"The workshop is based on a curriculum that the teachers can walk away from here with and use in their classroom," said Jamie Gardner of Geology/Geochemistry (EES-1).

The workshop, added Redden, also promotes earthquake hazard awareness and helps teachers learn safety tips on how to mitigate potential damage from an earthquake.

For example, during the "simulated earthquake" replete with workshop assistants shaking desks, pounding on doors and providing sound effects, teachers were told

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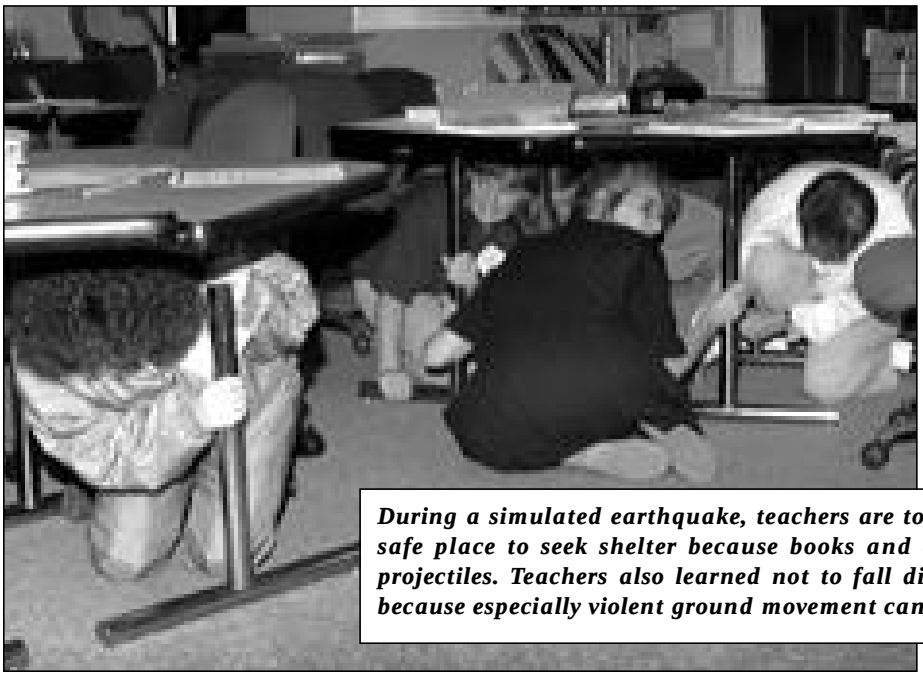

During a simulated earthquake, teachers are told that crouching under desks or tables is a safe place to seek shelter because books and other items on shelves can become deadly projectiles. Teachers also learned not to fall directly to their knees during an earthquake because especially violent ground movement can shatter kneecaps. *Photos by Fred Rick*

What is a seismograph?

How are earthquakes recorded? And what exactly is measured?

Earthquakes are recorded by a seismograph, which measures the usually small but sometimes large, motions of the ground, according to Leigh House of Geoengineering (EES-4). Seismographs also record ground motions from nearby explosions, from sonic booms and from cars and trucks.

kes are recorded by a seis-h, which measures the of the ground. The above aph is on display at the Science Museum.

The name "seismograph" is derived from the Greek word "seismos," which means earthquake. A seismograph contains three parts: a ground motion sensor, an amplifier (and maybe equipment to carry the signals to where they will be recorded), and a recorder.

The ground motion sensor is sometimes referred to as a "seismometer" and often consists of a weight on a spring. Motion of the ground produces relative motion between the enclosure of the sensor, which is fixed to the ground, and the weight, which hangs from the enclosure on the spring. That relative motion then produces the signal from the sensor, often by use of a magnet and a coil of wire. The larger the ground motion, the larger the signal the seismometer produces. The ground motions recorded are usually very small, perhaps a few microns or so. Since a micron is one one-thousandth (1/1,000) of a millimeter, the signals from the seismometer must be amplified, or magnified, before they can be recorded. The amplifier and signal transmission equipment magnify the signals from the seismometer, typically by a factor of several thousand, and carry those magnified signals to the recorder. With a magnification of 10,000, a ground motion of one micron would produce a recorded trace of 10 millimeters, or about 3/8 of an inch.

The recorder is where the signals are stored. Traditionally, seismographs recorded continuously onto a paper record, using pen and ink (such as the seismograph at the Bradbury Science Museum), or photographic film or paper. More recently, seismographs have been developed to use the data manipulation and storage capabilities available in computers. Although these digital seismographs can record continuously like the paper recorders, they usually include some form of earthquake detection so that they only store ground motion data from earthquakes or explosions.

The Los Alamos Seismograph Network records data from seven seismograph stations located in the Los Alamos area. Their data are received at a site at Technical Area 3 and recorded onto a personal computer. The network has been operated for more than 20 years, and has stored information from nearly 2,500 earthquakes in Northern New Mexico, as well as from many earthquakes located far away, such as in California, Japan or South America.

Dave Love, standing right, of the New Mexico Bureau of Mines and Mineral Resources talks to teachers participating in an earthquake preparedness workshop hosted by the Laboratory last fall. Standing next to Love is Jamie Gardner of Geology/Geochemistry (EES-1). The Federal Emergency Management Agency and the state Department of Public Safety also co-hosted the workshop at the Canyon Complex.

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that when they fall to the ground during an earthquake they shouldn't land directly on their knees. Rather, they should fall at a slight angle, resting on their hips or sides of their legs because violent ground movement can cause kneecaps to shatter.

Books, plants or other objects on shelves, desks and tables also can become deadly projectiles in an earthquake, teachers were told.

"Kids can read about earthquakes in a textbook; it's another thing to come to a workshop like this and do hands-on activities," said Sara Coney, a first- and second-grade teacher at Monte Vista Elementary School in Albuquerque.

"This is much more beneficial than what you get reading it out of a textbook."

Added Cecilia Martinez, a special education teacher of students in grades two through six at Sombrillo Elementary School in Española, "This has offered us a lot of information about the geology of the earth and the seismology of the local community.

"With more knowledge and familiarity, children will know how to react in an earthquake and not to panic," Martinez continued. "It's like a fire drill."

Stahm also found the workshop useful. "I can share this with other teachers and invite some of the facilitators of the workshop to come into my classroom," she said.

She said her students at Mountain Elementary already have used the curriculum in a drama exercise. "One child had to show the other children what to do in the event of an earthquake … I would tell them to get under a desk or somewhere secure because of falling objects."

The workshop also illustrates the Lab's continued commitment to community outreach, Gardner added.

The federal and state agencies plan several other workshops around the state this school year.

Jeff Bloch

Bloch receives NASA excellence award

Jeff Bloch of Astrophysics and Radiation Measurements (NIS-2) recently received a National Aeronautics and Space Administration Team Excellence Award for participating on a NASA review panel.

Bloch, who is the Lab's ALEXIS satellite project leader, was a panelist on a peer-review panel that evaluated the technical and scientific merits for NASA's upcoming Medium-class Explorer (MIDEX) astrophysics and space science projects.

Bloch said NASA periodically goes out to the community for peer review of new science missions. The review panel began its work late 1995 and concluded in March, Bloch said, noting he has previously served on other NASA peer-review panels.

Bloch received a certificate from NASA for his participation.

More information on NASA's MIDEX projects can be found by going to http://www.midex.gsfc.nasa.gov/ on the World Wide Web. The ALEXIS home page address is http://nis-www.lanl.gov/nis-projects/alexis on the World Wide Web.

Bower appointed to ACS public relations committee

Ken Bower of Analytical Services (CST-3) has been appointed to the Council Committee on Public Relations of the American Chemical Society for 1997.

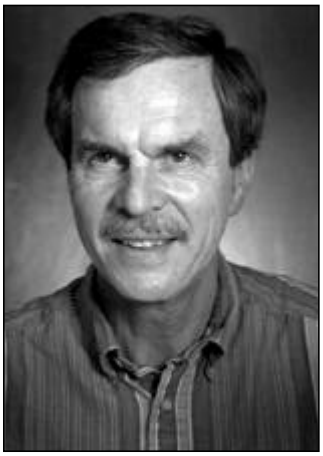
The committee establishes public relations policies, programs and initiatives for the American Chemical Society nationwide.

The American Chemical Society has 151,000 members and is the largest scientific organization in the world.

The society's goal is to improve the understanding of chemical science in modern society. Among other things, the society supports chemists in career development, and promotes collaboration and international dialogue between chemists. The American Chemical Society also awards about $1 million in scholarships to minority students annually.

Bower has been at the Lab six years. He has a doctorate in chemistry from the University of Akron in Akron, Ohio. Bower came to the Lab as a postdoctoral fellow in Materials Technology: Coatings and Polymers (MST-7).

Ken Bower, left, of Analytical Services (CST-3), works with students conducting a chemistry experiment at the Bradbury Science Museum. *Photo by Fred Rick*



Terence Mitchell

Terence Mitchell named 1997 Fellow of Minerals, Metals and Materials Society

Terence Mitchell of the Center for Materials Science (MST-CMS) has been elected a Fellow of the Minerals, Metals and Materials Society (TMS) for 1997 for his outstanding contributions to the field of materials science

Being named a fellow is the highest honor bestowed by the society, and there are no more than 100 living fellows at any time.

With the Lab since 1987, Mitchell directs the Electron Microscopy Laboratory in CMS. His research interests include the physical and mechanical properties of metals and ceramics, electron microscopy, dislocation theory, radiation damage, phase transformations, superconductivity and thin films.

"Of all the awards I have received it is the one I feel most pleased about because so few people receive it," he said.

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Mitchell named ...

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The Electron Microscope Laboratory is one of the best facilities of its kind in the world with six electron microscopes that have numerous experimental uses.

"The electron microscopes we have come in a variety of flavors," Mitchell said. "They basically magnify images of either the interior or the exterior of a sample. Electron microscopy allows you to see at the atomic scale what it is that controls properties."

Born in England, Mitchell earned a bachelor's degree from Cambridge in 1958, a doctorate at Cambridge in 1962 and an honorary doctorate in 1994.

"I have been fortunate to have found a stimulating research environment in the three places where I have pursued my career — the Cavendish Laboratory (in England), Case Western Reserve University (in Ohio) and now this Laboratory," he said. "In all three places it has been my good fortune to have worked with talented students, research associates and colleagues."

Mitchell will be recognized as a new fellow at the TMS annual meeting Feb. 11.

December service anniversaries

30 years
Valerio Armijo, P-25
Jimmy Laux, ESA-FM-ESH
James Noble, ESH-14

25 years
Carl Ekdahl Jr., NWT-PO
Donald Gettemy, ESA-TSE
Beraldo Montoya, ESH-1
Norman Morse, EM-RT
Betty Perkins, DX-DO
T. Douglas Reilly, NIS-5
Barbara Ritchie, CIC-1
Robert Stewart, CIC-7

20 years
Graydon Anderson, CST-6
Ezekiel Aragon, ESA-WE
Jerome Barton, CST-12
Thomas Brown, ESH-12
Theresa CdeBaca, FSS-11
Susan Carlson, CIC-1
Fermin Garcia, MST-6
Earle Marie Hanson, NMSM-PO
Marcella Kramer, CST-25
John Langford, ESA-EA
Nancy Marusak, EES-5
Dennis Naranjo, ESA-DE
Gerard Quigley, IP-PO
James Stelzer, AOT-2
Jose Valdez, NMT-2
Daniel Varley, ESA-WE

15 years
John Baumgardner, T-3
Gary Bequette, FSS-10
James Freyer, LS-4
James Holt, NWT-PO
Glenn Magelssen, X-TA
Joel Peterson, DX-DO
Phillip Rinard, NIS-5
Maurice Sheppard, X-NH
Barbara Smith, CST-12

10 years
John Archuleta, BUS-4
Cecilia Burciaga, DX-6
Anthony Cimabue, ESA-DE
Miles Corrie, CST-25
Maria Lujan, BUS-2
Fred Moya, BUS-4
Ronnie Quintana, BUS-6
Gene Sacoman, CIC-11
Nancy Sauer, CST-18
Gerald Seitz, DX-6

5 years
Richard Higgs, ESA-WMM
Bennie Martinez, CST-7
Derrick Montoya, DX-1
Mark Padilla, BUS-8
Rita Spencer, QP
Rachel Taylor, T-5

Twist of fate ...

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where the rider is seated in a reclined position. The bike, which either can be a one- or two-seater, is covered by an aerodynamic shell called a fairing.

Prime's achievements in this field are also impressive. He currently holds two world speed records. He set both records in 1993 in the same race at the Colorado Speed Challenge in Alamosa.

For this event, racers are allowed about a three-mile run to get the HPV up to optimum speed, with readings taken for the last 500 and 200 meters of the race. For the last 500 meters, Prime set a record of 60.4 mph; for the last 200 meters, it was 61.2 mph.

Like most cyclists, Prime has had his share of mishaps and accidents. "They just come with the territory," he sighed. "If you race enough times, you eventually crash. You lose a lot of skin."

Prime illustrated this point while competing last August in the HPV World Championships in Las Vegas, Nev. In the top speed event, Prime finished third. In the tandem competition, Prime and his partner won the road race event. So far, so good.

Then it all came crashing down in the one-hour time trial — literally. Prime was in second place, cruising at about 40 mph on the oval track, when he lost control of the HPV and slid head first into a concrete retaining wall.

Prime managed to expedite repairs on the bike and actually finished the race, several laps behind the others. "I didn't suffer any major injuries from the crash, but I did have one heck of a headache and sore neck the next morning," he said.

Injuries notwithstanding, Prime has a goal for HPV racing: to set a world record in the tandem category. He feels he can do it, for at 30 years old, Prime still is in his prime.

UC Berkeley crew members help situate Prime in the human-powered vehicle just before placing the top half of the aerodynamic fairing over him during a 1989 collegiate HPV competition in San Jose, Calif.

"Science at Home" is a publication developed by the Science Education and Outreach Group (HR-SEO) 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.

How to Make a Balance Scale

(Science at Home Experiment No. 21)

If you take a trip to a well stocked hardware store, you'll be amazed at how many different devices are available for measuring things. You'll find rulers and tapes for measuring distances, all sorts of containers for measuring volume, and, of course, there are scales. Many modern scales are quite elaborate with digital read-outs, computer assisted sensors, complex counter-weight systems, and a variety of high tech innovations all aimed at increasing the accuracy of the measurement, but even the fanciest scale is based on the concept of balancing and comparing two forces against one another.

In this activity you will create your own simple balance scale that can be used for several of the activities in this book.

Stuff you'll need

scissors
a metal clothes hanger
36" (90 cm) of string or yarn
2 same sized paper cups
a sharpened pencil
a metal nut or washer
masking tape
ruler
pliers
a crayon

How to make a balance scale

1) Measure 2 inches (5 cm) in from the end of one arm of the hanger and mark the spot with the pencil. Repeat on the other arm (diagram 1).

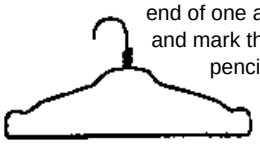


diagram 1

2) At the pencil marks, use the pliers to squeeze downward toward the bottom of the hanger, forming an indentation, or dent, in the hanger (diagram 1).

3) Use the pencil to mark an X on one side of each cup about half inch (1 cm) down from the top. Repeat on the opposite side.

diagram 2

4) Use the pencil point to make a small hole through each X.

5) Cut the string into three 12 inch (30 cm) pieces. Thread the ends of one piece of string through the holes in one cup (diagram 2). Repeat using another string and cup.

6) Hang the cups over the indentation in the hanger (diagram 3). The cups should be hanging at equal distances from the center of the coat hanger. Hang the hook of the hanger from your index finger.

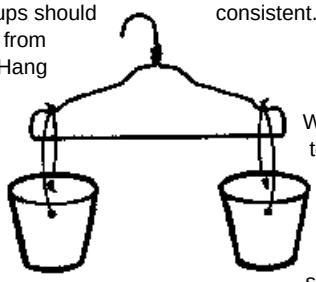


diagram 3

7) Tie one end of the third string to the washer. Tie the other end around the base of the hanger hook (diagram 4).

8) Wait for the string to stop swinging. With a crayon, mark the place where the string touches the hanger with a crayon. Place two small pieces of tape on the hanger on either side of the crayon mark. When the string rests on the mark between the tape, the scale is balanced (diagram 5). Use the scale to decide when two sets of objects are of equal weight. The heavier side of the scale will have the cup that is further down than the other side.

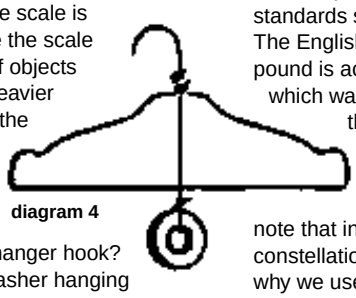


diagram 4

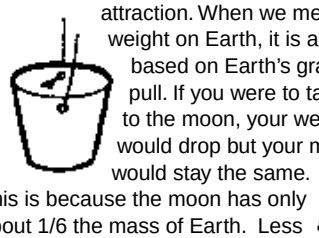
9) Why is it important for the cups to hang at equal distances from the hanger hook? What purpose does the washer hanging from the string serve?

Wrap-up

The cups should be equally spaced to provide maximum accuracy. By having them at exactly the same distance from the center, you eliminate one of the variables that might effect your measurements. The washer is acting as something called a plumb bob. It provides a standard point for all the measurements. In addition to the spacing of the cups the way the hanger is suspended from your finger may also cause inaccuracies. Be sure to take these variables into account as you measure.

What's going on here?

To understand why a balance scale works, you have to understand the difference between weight and mass. By definition, an object's mass is the amount of matter or "stuff" that it contains. Weight, on the other hand, is the mass of the object multiplied by the pull of gravity. Gravity is a force of attraction between objects that have mass. The greater the mass, the greater the force of attraction. When we measure weight on Earth, it is always based on Earth's gravitational pull. If you were to take a trip to the moon, your weight would drop but your mass would stay the same. This is because the moon has only about 1/6 the mass of Earth. Less mass means a smaller pull of gravity and a smaller pull means a lower weight. On Earth, the terms mass and weight are often interchanged because the pull of gravity is very consistent.



Where does this happen in real life?

We have come to depend on scales to weigh food and other products, we even depend on them to weigh ourselves. In the early days, standards of measurement changed from place to place. Often, the standard was based on a set amount of a local commodity like a jar of oil. Sometimes, it was based on the weight of the king, which as you might expect, could vary on a daily basis. By Roman times some basic standards started to gain wider acceptance. The English unit of measurement called the pound is actually based on the Roman libra which was a standard for measuring gold. In this case, a block of pure gold of a specific dimension was set as the standard and everything else was compared to it. It is interesting to note that in Roman astronomy, Libra is the constellation depicted by scales. Libra is also why we use the abbreviation lb for pound! The gram, which is the standard unit of mass in the metric system was based on the weight of water. Scientists selected water as a standard because it is more common than gold. They set a gram as the weight of exactly one cubic centimeter of water at its maximum density, which occurs at 3.9 degrees Celsius. The interesting thing is that every once in a while, we still come across old measurement standards in modern day society. Nails bought at a hardware store are classified by penny weight. Can you guess what they use as a standard?

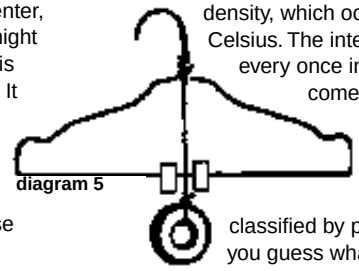


diagram 5

Now try this

You can modify your scale to give you absolute weight rather than simple relative weight by using a standard amount of material in one of the cups. One of the easiest and cheapest things to use are fishing weights. They come in various sizes in one ounce gradations. Place an object in one cup, and see how many fishing weights it takes to balance it. By adding up the weights, you'll get a total weight for the object. To convert from ounces to grams, simply multiply the total by 28. There are 28 grams in an ounce.

This month in history

January

1912 — New Mexico becomes the 47th state

1918 — The Los Alamos Ranch School opens for students

1920 — The New York Times says in an editorial that rockets will never fly

1943 — First contract signing for the University of California to operate the Laboratory

1947 — The Los Alamos Laboratory has a name change — to the Los Alamos Scientific Laboratory

1947 — Movie prices at Theaters No. 1 and 2 in Los Alamos increase from 15 cents to 20 cents for adults and from 10 cents to 15 cents for children

1961 — Glenn Seaborg becomes the first scientist to be named chairman of the AEC

1978 — First intergrated systems test of Helios, an 8-beam laser facility at the Lab that included the world's largest carbon dioxide laser

1981 — Another name change — now it's the Los Alamos National Laboratory

1986 — Sig Hecker becomes the Laboratory's fifth director

1994 — The Lab's Human Studies Project Team is formed to support DOE's Openness Initiative and respond to public concern about human radiation studies

1994 — Los Alamos and Arzamas-16 sign agreements to collaborate in nonproliferation, nuclear reactor safety, fundamental physics, environmental technology and cleanup, and industrial applications

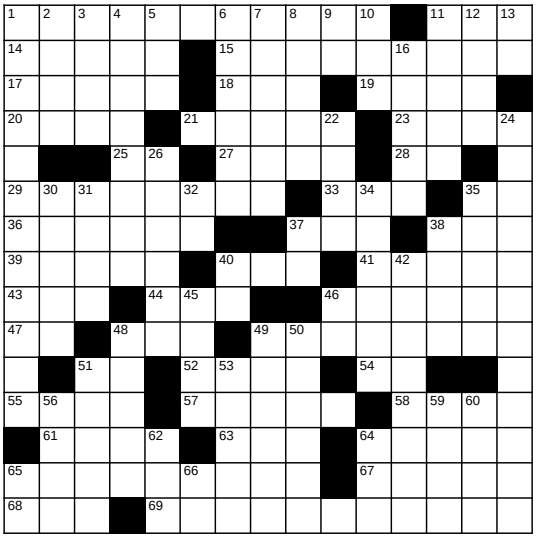
Syndicated material removed at the request of the syndicate

Crossword puzzle

ACROSS
1 Business relation
11 Resort
14 Farewell: Haw.
15 America: Fr.
17 Serious
18 Feast day
19 Particular
20 Indian buzzard
21 Clever
23 Nipple
25 Musical tone
27 Understands
28 Stammering sound
29 Inactivity
33 Make a mistake
35 Mr. Hopkins
36 Look for
37 Metal bearing rock
38 Fondle
39 Fig hters prize
40 Charged particle
41 Cackle
43 Broadcasting Co.
44 Criticize
46 Hesitate
47 That is: Abbr.
48 Telecom. Co.
49 In ___: gauche
51 Land measere
52 Chilled
54 Type measure
55 Ireland
57 Cap or bear
58 Table extension
61 Goddess of fate
63 Fireplace item
64 Tropical fruit
65 Wireless inventor
67 Farewell: Fr.
68 Hot beverage
69 Played in Superman

DOWN
1 A man in his nineties?
2 Medicinal plant
3 Steals
4 Movie houses
5 Near: Poet
6 Guilty of neglect
7 Avers
8 Rashness
9 Pronoun
10 Greek letter
11 Convey scorn
12 Arizona tribe
13 Equally
16 Total
22 European river
24 One _____.
26 Start a career
30 Two
31 Dr. Zhivago heroine
32 What's you say?
34 Empathize
35 Father
37 Not off
38 Stock transactions
40 Elected
42 "Shane" star
45 On tip-toe
46 Fire Dept.: Abbr.
48 Sphere of activity
49 To be a part of
50 Dance
51 Odor
53 Hue
56 English playwright
59 Geraint's wife
60 Askew
62 Limb
64 French month
65 Mountain: Abbr.
66 Pacific state: Abbr.

The December crossword puzzle answers are syndicated material removed at the request of the syndicate



spotlight

Twist of fate creates a world-class cyclist

by Ternel Martinez

Mike Prime

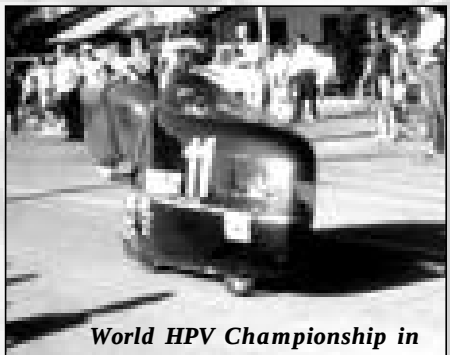
Sometimes an injury is the best thing that can happen to a person — depending, of course, on the extent of the injury. In an era where injuries have shortened or, worse, ended sports careers, world-class cyclist Mike Prime is one of the lucky few to have benefited from one.

Prime, a mechanical engineer in Engineering Analysis (ESA-EA), tore a ligament in his left knee playing soccer in December 1986 while attending the University of California, Berkeley. The injury required two surgeries and a year of physical therapy. He couldn't even walk for three months.

Then fate took over. "Riding a bike is one of the first exercises doctors let you do after you've injured your knee," said Prime, adding while he had ridden bikes even before his accident, he doubts he would have become a world-class cyclist had it not been for the injury.

Fairly quickly, Prime got better and faster. He began competitive cycling as part of UC Berkeley's third-string team beginning in March 1988. Back then, he was at the lowest of five racing levels. The only way to advance is to enter major competitions, both as a member of a team and individually, and either win or place strongly. A cyclist must race all over the country in order to reach the top category.

Two years later, Prime reached the top racing level and was on the first-string cycling team. His impressive racing résumé includes being two-time medalist in the U.S. National Track Championships, six-time medalist in the Collegiate National Track Championships and four-time champion of the Western Collegiate Cycling Conference.



World HPV Championship in Eureka, Calif., 1992: Prime finished fourth that year.

By 1993, Prime qualified for the Olympic Trials, a competitive level achieved by only about 150 of the approximately 30,000 licensed bike racers in the country. He competed in the trials last June in Trexlertown, Pa.

Cycling events take place either on the road (and therefore not surprisingly called road races) or on a 333-meter track called a velodrome. Prime's events took place on the latter. He competed in the points and match sprints races.

In the points race, cyclists complete 120 laps, with sprints occurring every five laps. The top finisher in each sprint receives five points; the second-place finisher gets three points, and third place is worth one. Whoever has the most points at the end of 120 laps wins.

The match sprint has more of a strategic flavor to it. The race starts out slowly, with two cyclists trying to position themselves just so for the final lap. Gradually, the racers pick up the speed. By the last lap, both are sprinting to the finish line. Only the winner for each event gets to represent the United States in the Olympics.

Olympic trials in Trexlertown, Pa., 1996: Prime, fourth from left, keeps pace with the motorcycle in front during what's called a keirin race. The racers sprint to the finish as soon as the motorcycle pulls out of the race. Competitors are actually allowed to bump each other out of the way to better position themselves for the final sprint in this event. *Photos courtesy of Prime*

In the points race, Prime finished 35th out of about 100 competitors. He finished 40th of about 60 racers in the match sprints. Prime said he knew he wouldn't win his races, citing three reasons: There is no velodrome in New Mexico for him to practice on; working fulltime at the Lab cuts deeply into his practice time; and there aren't that many races in the state for him to compete in and remain competitive.

But he added, "I worked so hard over the years just to qualify, I wanted to feel the experience. Besides, I love racing against the best.

"I had a great time. It was fun," he recalled. "I'd been to national championships many times and had competed against several of the people at the trials before, but the experience was completely different."

And now for part two of Prime's story.

As it turns out, his love for racing has carried over to a strange-looking contraption called a human-powered vehicle. It's basically a bicycle

continued on Page 9

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