Reflections

Los Alamos National Laboratory Vol. 3, No. 8 • September 1998

Fingering fraud

... see pages 6 and 7

A Department of Energy/University of California Laboratory

Inside this issue ...

Cover illustration by Edwin Vigil

Reflections

Reflections, the Laboratory monthly publication for employees and retirees, is published by the Public Affairs (PA) Office. The staff is located at TA-3, Building 100, and can be reached by e-mail at *newsbulletin@lanl.gov*, by telephone at 7-6103, by fax at 5-5552 or by regular Lab mail at Mail Stop C318. The individual telephone numbers are listed below.

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Printed on recyclable paper

editor's journal

A new modus operandi for Public Affairs

Better communications. We hear about the need for this all the time. Individuals, families, institutions, corporations, nations ... they all have recognized the importance of communicating and the ramifications that come from doing it ineffectively or not at all.

While I like to think that in recent years the Laboratory has made real strides in its communications efforts, I believe we still have a way to go before we as an institution can profess to embody effective and efficient communication. But that's OK. The important thing is that we recognize the value of communicating and continue to look for ways to improve. Ask anyone who knows about communicating, and they will tell you that doing it consistently well is a difficult task, one that requires vigilance.

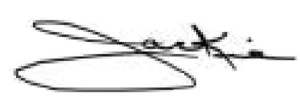
Since the last time I sat down to write this column, the Public Affairs Office, which produces "Reflections," initiated some organizational changes that are designed to help us facilitate better communications at the Laboratory. I'd like to briefly share these changes with you.

The Public Affairs Office formerly was made up of the Public Information Group (PA-1), which was divided into the Media and Employee Communications teams, and the Conference and Visit Management Group (PA-4). While Public Affairs still has CVM, Public Information is no more. Instead, we have formed four internal "offices" to help address the Laboratory's communication needs. The management team for Public Affairs now consists of a director, a deputy (slot to be filled) and four office leaders.

Three of these offices will focus on the communications issues of the organizations under the deputy and associate Laboratory directors. The fourth office primarily will be responsible for Public Affairs products, such as "Reflections," the Daily Newsbulletin, "Dateline: Los Alamos," news video and the like. PAO's organizational changes should not affect any of these products.

What's behind the changes? Basically, the changes were made to help increase information flow and communications planning at the Laboratory. Public Affairs hopes to accomplish this by having staff who are dedicated to interacting with specific organizations and who are privy to the communications issues, needs and concerns of these organizations. It's hoped that this increased information flow coupled with strategic planning will improve meaningful communications between management and employees and between the Laboratory and its other audiences, such as funding agencies and surrounding communities.

What we've embarked on is a new approach for many of us in Public Affairs, and I believe that an important factor in how well it works is the level of cooperation between Laboratory organizations and Public Affairs staff. No doubt there will be a few "bumps" along the way as we travel down this uncharted path toward enhancing the lines of communication at the Lab. But if this change in modus operandi for our office truly helps improve communications, then all the bumps will have been worth it.



The science of meteorology

by Steve Sandoval

Weather Channel junkies understand tropospheric undulations, gust fronts and isobars. The cable television network that is all weather all the time has made the science of meteorology more than just a quick glance skyward or three minutes on the evening newscast.

The science of meteorology and the larger field of atmospheric science is more than just plotting L's and H's on weather maps, according to Jeff Baars of Air Quality (ESH-17), one of several professional meteorologist working at the Laboratory. Atmospheric science, he said, encompasses everything from tropical cyclones to global climate studies to polar meteorology.

Baars and Keeley Costigan of Atmospheric and Climate Sciences (EES-8) had some interest in weather when they were growing up. They didn't think they would become meteorologist. Both grew up in the midwest — Baars in Illinois and Costigan in Iowa — and remember well the drill of running into the basement of their childhood homes because of tornadoes.

Jeff Baars of Air Quality (ESH-17) looks skyward and writes some notes that he will use in preparing weather forecasts for the Laboratory. Baars writes the monthly weather summaries and provides weather data for the Lab's weather page. *Photos by Fred Rick*

Keeley Costigan of Atmospheric and Climate Sciences (EES-8) writes some notes in a log about precipitation produced from a computer simulation at her office at Technical Area 3.

"The weather was always in your face. It was always hot, always cold or we were running down in the basement to hide from a tornado," said Baars.

Costigan's father was a weather observer for the U.S. Marines. Costigan was always good in science and math, so she took some introductory atmospheric science classes at Iowa State, eventually earning a bachelor's degree in meteorology and a master's degree and doctorate in atmospheric science from Colorado State University.

Baars took an introductory atmospheric sciences course at Western Illinois University, where he earned his bachelor's degree in meteorology. Before Baars joined the Laboratory, he read weather forecasts on radio and ran a graduate student lab at Ohio State University as a research assistant while completing his master's degree in atmospheric science.

In addition to providing the monthly weather summaries and weather data for the Lab's weather page, Baars also does air-quality research, environmental monitoring and computer programming, and he is involved in the Lab's emergency response efforts when weather may be a factor.

Costigan worked as a contractor for the Air Force at Hanscomb Air Force Base near Boston before she earned her doctorate. At the Lab, she works primarily on computer modeling and air quality research, trying, for example, to simulate the flow and direction of plumes of pollutants. She's also working on a project to simulate precipitation in the Rio Grande Basin and study how large scale changes in climate would affect the basin.

Baars and Costigan think meteorology is an important science because weather affects people every day. "It affects everybody directly … what you wear to work that day, how you get to work. For farmers, it affects their livelihood," said Costigan.

"When I tell people I'm a meteorologist, they think I am a television weatherperson," said Costigan. "There's a lot more involved."

Baars said people sometimes forget that meteorology is science, and he echoed Costigan's point that the profession requires a solid grounding in math and physics. It helped Baars that he minored in math in college.

For someone who wants to pursue meteorology as a career, Baars said watching the Weather Channel is a good primer. He also suggested taking math and physics and computer programming courses.

For the record, tropospheric undulation refers to instability in the troposphere. A gust front marks the leading edge of advancing cold air from a thunderstorm downdraft. And isobars are lines of equal atmospheric pressure. By looking at isobars on a weather map, meteorologist can pick out where good and bad weather is occurring.

Award winning Lab technologies

— Adapted from an article in Dateline: Los Alamos *by Meredith Coonley and Kathy DeLucas of the Public Affairs Office.*

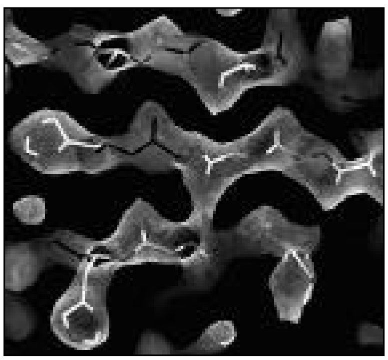
Advances in communications, explosives and computational techniques mark this year's R&D 100 awards received by the Laboratory. The Laboratory earned four of the prestigious awards, bringing its total to 56 R&D 100 awards in the past 11 years.

The awards are presently annually by R&D Magazine to honor the products, materials, processes, software and systems with the most significant commercial promise.

Here are summaries of this year's winning technologies.

3-D Pictures of Proteins

Proteins are remarkable molecular machines that perform numerous functions essential to life, such as the control of blood clotting and the synthesis of complex organic compounds. Pictures of proteins are in high demand in the biotechnology and health-care fields because of their importance in the design of new drugs and in the engineering of new enzymes for commercial use.



This slice of a 3-D picture of a protein molecule was produced by SOLVE, a new technique to visualize the intricate structure of proteins. The gray shading shows the location of electrons in the protein, and the short "sticks" show the bonds connecting the atoms.

A new technique developed by Los Alamos researchers — SOLVE — creates three-dimensional pictures of protein molecules faster than any other available method. And because SOLVE is automated, it is easy to use and very fast.

Constructing a picture of a protein is a formidable task because proteins are too small to be seen with a microscope. The most common way of constructing these pictures is by X-ray crystallography in which a crystal of a protein placed in an X-ray beam is measured at different orientations. Additional measurements provide sufficient information to make a 3-D picture of the densities of electrons throughout the molecule. This picture can be used in determining the position of most or all the atoms in the protein.

The initial and most important step in producing the picture is turning the sets of raw X-ray diffraction measurements into a map of electron densities. Until now, this task could be done by only by a highly skilled protein crystallographer and took several days or even weeks to complete.

SOLVE's computer software application analyzes how X-rays diffract off crystals in a protein molecule and then draws a 3-D picture of the protein. It produces these pictures by automatically solving for the missing information in X-ray crystallography.

After analyzing the diffraction measurements, SOLVE chooses the best starting solutions, or educated guesses, about the arrangement of heavy (metal) atoms in a protein, generates improved solutions and ultimately draws an accurate picture of the protein molecule. Automating the generation, evaluation and ranking of starting solutions is the most important innovation designed into SOLVE.

As a result, SOLVE can test many possible solutions and choose the best. The system allows a technician with an hour of training to run and determine with confidence whether a picture of sufficient quality can be constructed from the raw data.

The system was developed by Tom Terwilliger of Structural Biology (LS-8) and Joel Berendzen of Biophysics (P-21).

Low-Smoke Pyrotechnics

A thousand years after the Chinese invented black powder and fireworks, new mixtures developed by Lab scientists make it possible for the first time to produce spectacular fireworks of any size that are safe in either indoor or outdoor settings. Over the centuries, fireworks makers have improved the colors, sent aerials higher and replaced excessively dangerous materials, but they have not improved or eliminated the inconsistent, dangerous heart of fireworks: the black powder.

The new low-smoke, nitrogen-rich mixtures will change this picture.

By combining an energetic, nitrogen-rich fuel with nonmetallic oxidizers and unprecedentedly low levels of metal coloring agents, the new Los Alamos-developed mixtures produce clean flames that generate virtually no smoke or ash. The mixtures enhance the deep, bright colors typical of traditional pyrotechnics and offer a reliable alternative to black powder-based propellants at a reasonable price.

The applications of this technology extend far beyond the realm of entertainment.

Because smoke plumes or "signatures" from missiles can pinpoint the location of a launch site and thereby decrease the defensive posture of the attacker, there is a great need for low-smoke, "reduced-signature" propellants in tactical military rockets.

When air bags in motor vehicles are deployed, the propellant used to inflate the air bag, sodium azide, leaves a toxic and corrosive residue

continued on Page 5

The Lab has developed new mixtures that keep fireworks spectacular while making them safe in either outdoor or indoor settings. The technology is also valuable for other applications, including the production of propellants that make rocket launches harder to detect.

continued from Page 4

on a person's face, hands and upper body. A nitrogen-rich fuel would offer a nontoxic, noncorrosive alternative to sodium azide.

The technology was developed by Mike Hiskey, David Chavez and Darren Naud, all of High Explosives Science and Technology (DX-2).

Underground Radio

Anyone who has lost radio reception when driving around a mountain has experienced the same phenomena that workers underground do: Radio waves cannot penetrate rock.

Researchers at Los Alamos and Raton Technologies of Raton, N.M., have developed an underground portable radio receiver capable of receiving communication through hundreds of meters of solid rock. The receiver features high sensitivity and low noise because it uses a detector made of high-temperature superconducting material, which loses all electrical resistance at liquid nitrogen temperatures.

The underground communications systems most commonly used are hard-wired links such as phone lines, coaxial cables, mining car tracks, short-range radio links or line-of-sight communication. Many of these systems restrict the mobility of an underground worker and can be disrupted by fires or rockfalls, the very circumstances in which it's vital to get information to and from the miners.

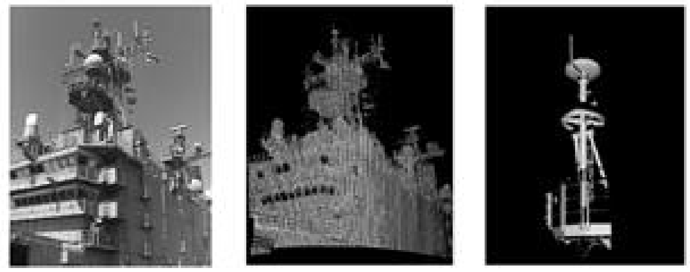
The Los Alamos underground radio uses a highly sensitive, low-noise magnetic field sensor called a SQUID — superconducting quantum interference device — to measure the small changes in magnetic flux produced by low-frequency radio waves passing through the rock. This new system can alert miners to underground conditions during fires or rock falls. It can be used to locate miners trapped underground or accurately determine the positions of underground machines.

Since the Los Alamos underground radio is portable and does not require hard-wire links, communication can occur within the deepest reaches of a mine. The portability and low cost of the system make it physically and economically feasible to equip a large portion of the 70,000 underground miners in the United States and the millions of underground miners worldwide with the means to receive timely information in the event of a mining emergency.

With some modification, underground radio could be used to communicate with divers or underwater vehicles to a depth of about 100 feet in seawater. Another possible application is in mineral exploration, where an analysis of the magnetic field around a borehole could be used to help determine the local geology.

Researchers at the Lab and Raton Technologies of Raton, N.M., have developed an underground portable radio receiver that can be used for communications through solid rock. The receiver uses a high temperature superconducting magnetic field sensor to detect low frequency radio waves as they pass through rock. *Photo by John Flower of Imaging Services (CIC-9)*

The Laboratory's principal developers of underground radio are David Reagor of Electronic and Electrochemical Materials and Devices (MST-11) and Quan Xi Jia of the Superconductivity Technology Center (MST-STC).



Cyrax, a portable laser and radar system that produces 3-D images of physical structures, was used in a pilot study of the USS Tarawa. It scanned the superstructure (photo at left) in about three minutes, then produced a digital representation (middle) and a textured map of the mast (right). Dimensions of the entire superstructure were produced in 11 hours.

Laser-Mapping and Imaging System

It is estimated that of the $180 billion to $250 billion spent annually on construction, as much as 5 percent is wasted on correcting field and fabrication errors. More than 60 percent of the construction done today is either revamp or expansion work, as more owners focus on extending the lives of existing facilities.

Expansions and revamps require as-built documentation; computer-aided design files are preferable. Since the existing documentation is often obsolete, field surveys are required. Using conventional methods to update or create models of an existing facility is slow, costly and often impossible.

Cyrax has been developed to meet the need for a quicker, cost-effective way to create three-dimensional models. The portable integrated laser radar and modeling system produces a 3-D digital image. The technology was co-developed by Los Alamos, Cyra Technologies of Oakland, Calif., and MIT Lincoln Laboratory.

Cyrax eliminates the need for labor-intensive, error-prone survey methods. In addition, because of its powerful laser radar, it provides great accuracy and range unavailable with any other laser-based system. It is the only completely integrated system for acquiring, visualizing and modeling accurate 3-D data. The system's output is 3-D digital representations and models of large objects such as oil refineries, buildings, mines and ships.

Cyrax was developed primarily for the architecture, engineering and construction industry to create as-built CAD drawings of buildings, ships, refineries, manufacturing operations and mines, to name just a few.

It has been used in a pilot study with an oil company to create as-built drawings of oil field facilities, where it is estimated that Cyrax can save the company 30 to 40 percent in the modeling process and cut field surveying from several months to a few weeks. In a study for the U.S. Navy, Cyrax performed a shipcheck in one-third the time it normally takes.

The Laboratory co-developers of Cyrax are Kerry Wilson, Clayton Smith and Dan Neagley, all of Biophysics (P-21).

Fingering fraud by pinpointing patterns

by Ternel N. Martinez

It started out in April 1992 as a friendly conversation between two strangers sitting next to each other on a plane. On the surface, it seemed as if they had nothing in common: One was a Lab employee, Chris Barrett of the Technology Safety and Assessment (TSA-DO) Division (currently on leave of absence); the other was a district director for the Internal Revenue Service.

One of the topics they discussed was the then-relatively new electronic tax filing service offered by the IRS and the problem of fraud related to the service. Because the IRS promises a rapid refund to taxpayers choosing to file electronically, it is especially difficult to identify fraudulent returns in time to stop the refund checks being issued. Barrett, thinking the Lab may be able to help the IRS in some fashion, went back to Los Alamos to discuss the problem with others.

One thing led to another, and about a year later, the Lab and the Criminal Investigation Division of the IRS entered into a three-year agreement calling for the Lab to develop software that helps the IRS better detect electronically filed income tax fraud. Electronic tax return filing today accounts for approximately 30 million of the 150 million tax returns filed each year.

Of course, before the Lab could begin work on developing a software package capable of identifying suspicious tax returns, it needed access to actual returns, said project leader Chris Barnes of Computational Methods (X-CM). Therein lay one of the biggest hurdles the Lab had to jump before the IRS would enter into the agreement: convincing the agency that it could be trusted with the returns and prevent anyone other than those working on the project from viewing them.

"Throughout the years, more than 40 people have been involved with the project, although only 10 to 12 employees have been involved at any one time," said Barnes. "The IRS was very concerned about the potential for misuse of taxpayer information, and we took the privacy issue very seriously." The project was carried out in a controlled-access former vault deep within the Administration Building. Only project members were granted unescorted access.

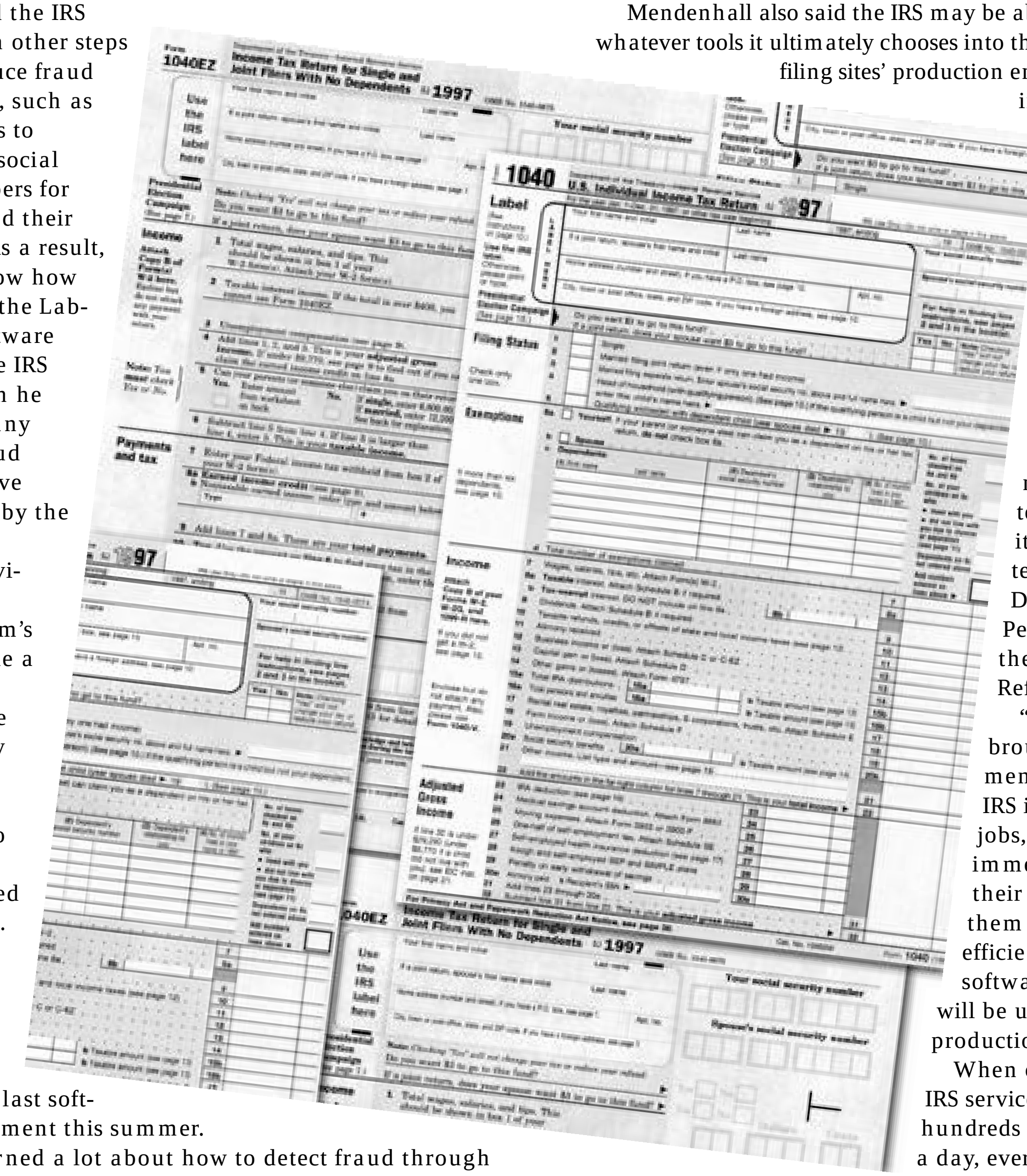
Because the Lab's agreement was with the Criminal Investigation Division of the IRS, the Lab focused its efforts on detecting criminal tax fraud, not civil tax fraud, Barnes pointed out. While the difference between the two is not clear in some cases, he added, examples of criminal tax fraud include completely fabricating tax returns or W-2 statements, submitting multiple tax returns or an IRS-authorized electronic return originator (the person who ultimately sends the return to the IRS) altering an individual's tax return, Barnes said.

Interestingly, the same Laboratory-developed software that helps Los Alamos in its counterproliferation efforts — involving the same pattern recognition techniques used to monitor export licenses issued for consignment of materials that could be used in nuclear weapons — has helped the IRS greatly reduce the proliferation of fraudulent electronic tax returns.

Over the years, the software has undergone several major enhancements. For example, the first software the IRS received, used in the Cincinnati service center (one of five IRS electronic filing sites — the agency has 10 service centers overall), allowed the agency to view returns on computers. The next enhancement provided "scores" and other selective methods for individual and group returns. More recent improvements have given tax examiners the capability to identify groups of suspicious returns that may all belong to the same scheme (originated by the same perpetrator).

Barnes is careful not to give too many details regarding the software and subsequent enhancements that he and his team have made over time. But in essence, the software helps "flag" potentially fraudulent tax returns for IRS tax examiners to investigate further, he said. The software can accomplish this in many ways, such as detecting patterns across multiple returns and comparing recent and past returns.

In the case of an originator altering someone's return, Barnes said, "It's now much more difficult for them to fraudulently alter tax returns and get away with it because the software can scan hundreds of returns that he or she has prepared, looking for patterns," said Barnes. "The software also can detect fraudulent patterns in returns indicating they were prepared by the same person, even if different names and addresses were used."



Barnes said the IRS also has taken other steps to further reduce fraud over the years, such as requiring filers to provide valid social security numbers for themselves and their dependents. As a result, he did not know how much money the Lab-developed software has helped the IRS save, although he noted that many major tax fraud operations have been detected by the software.

The IRS obviously thinks the team's work has made a difference, for in 1996 the federal agency extended its agreement an additional two years, and at much-increased funding levels. The team presented the Cincinnati service center with the latest and last software enhancement this summer.

"We've learned a lot about how to detect fraud through our interactions with the Lab," said Kevin Mendenhall, a program analyst in the Criminal Investigation Department's Office of Refund Fraud at IRS Headquarters in Washington, D.C. "We have confirmed that it is extremely difficult to differentiate between a good tax return and a fraudulent tax return. There is no magic formula."

Mendenhall noted that over the years, the Lab has given the IRS several distinct software tools designed to help the agency flag suspect returns. "We're still evaluating these tools to determine which tool(s) we'll eventually incorporate into our production environments."

Mendenhall also said the IRS may be able to incorporate whatever tools it ultimately chooses into the other four electronic filing sites' production environments sometime in the near future, depending on how far along the agency is in making sure all its systems are year 2000-compliant. The IRS is far ahead of schedule in this regard compared to other federal agencies.

The Lab also took notice of the project team's work, presenting it with a large-team 1996 Distinguished Performance Award (see the October 1997 issue of Reflections).

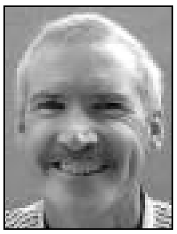
"This software has brought about a fundamental change in the way IRS investigators do their jobs, enabling them to get immediate infor-mation at their fingertips and allowing them to do their jobs more efficiently. And unlike most software projects, this one will be used in nationwide production," said Barnes.

When one considers that each IRS service center handles hundreds of thousands of returns a day, every bit of assistance helps.

Eaton named group leader

Lawrie Eaton has been named group leader for Engineering Sciences and Applications -Tritium Science and Engineering (ESA-TSE).

A Laboratory employee since 1986, Eaton was group leader for the former Accelerated Technology-Radio Frequency (AT-5) group from 1988 to 1994. Before joining the Laboratory, he worked for the Massachusetts Institute of Technology Lincoln Laboratory on satellite tracking systems. He also worked at Lawrence Livermore National Laboratory.



Lawrie Eaton

Eaton received bachelor's and master's degrees in electrical engineering from the University of Maine. He received a master's of business administration from St. Mary's College in California.

Griego named AA-4 group leader

Gil Griego is the new Group Leader for Internal Evaluations (AA-4). As the "Whistleblower Officer" for the Lab, his office is in charge of investigating various charges of improper activities at the Laboratory.

Gil Griego

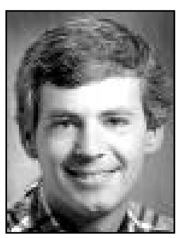
Griego hopes to initiate a successful awareness program for fraud and waste abuse. His goal is to lower the number of incidents. "We need to make the Lab aware of problems, and make employees aware of their responsibilities," he said.

A 13-year employee of the Laboratory, Griego has a bachelor's degree in accounting from New Mexico Highlands University.

Martineau to attend symposium

Rick Martineau of Dynamic Experiment Design and Engineering (DX-5) has been selected as one of 83 young engineers to attend the National Academy of Engineering's 1998 Frontiers of Engineering Symposium.

The annual event is intended to bring together some of the nation's top engineers ranging in age from 30 to 45. The symposium will take place Sept. 17 through 19 at the Arnold and Mabel Beckman Center in Irvine, Calif.



Rick Martineau

Attendees can hear presentations and participate in discussions of cutting-edge engineering. This year's symposium focuses on biomedicine and biomaterials, simulation in manufacturing, advanced materials, and robotics.

Martineau has bachelor's and master's degrees in mechanical engineering from Kansas State University. He received his doctorate in mechanical engineering from Colorado State University.

Yarbro recognized by NMSU society

Stephen Yarbro of Actinide Process Chemistry (NMT-2) has received the Sociedad de Ingenieros Eminente Award from New Mexico State University in Las Cruces.

Steven Yarbro

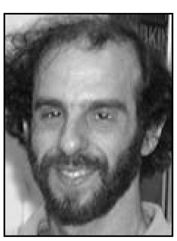
The society was formed by NMSU's College of Engineering to recognize accomplishments of NMSU alumni.

Yarbro was recognized for his research in the area of radioactive liquid waste recycling and recycling of nitric acid.

He received a plaque and a medal from NMSU during the school's commencement exercises last spring.

Yarbro has bachelor's and doctorate degrees in chemical engineering from NMSU and a master's degree in chemical engineering from the University of New Mexico.

Ginsparg awarded for creation of e-Print Archive



Paul Ginsparg

Paul Ginsparg of Elementary Particles and Field Theory (T-8) has won the Special Libraries Association's 1998 Physics Astronomy Math Award for his creation of the Los Alamos National Laboratory Electronic pre-print Server, officially called the e-Print Archive. The archive is an online database in which physicists, mathematicians and others may post their papers online for immediate worldwide dissemination.

More than 30 physics subdisciplines alone are represented on the archive, which receives more than 100,000 hits per day. The system, which at one time resided in a computer underneath a desk in Ginsparg's office, now is funded by the National Science Foundation and the Department of Energy. It is at http://xxx.lanl.gov on the Web.

One of the major benefits of the online archive is that it allows researchers to obtain direct feedback from their peers and to make revisions to their articles, if necessary, based on that feedback. Since Ginsparg created the archive back in 1991, it has gone from its original design of receiving 100 papers per year to more than 25,000 per year. This is more than twice the volume handled by the American Physical Society, which publishes about 10,000 articles per year.

In addition, the archive is mirrored in 15 other countries, serving as local repositories for the Lab archive; the mirror network also is updated daily. Recently, it began receiving articles from those in mathematics, and it soon will be receiving submissions from the computer sciences.

Ginsparg, a high-energy particle theorist, received his bachelor's degree in physics from Harvard University and his doctorate in theoretical particle physics from Cornell University. He has been at the Lab since 1990.

August employee service anniversaries

35 years
Donald Milligan, NIS-4

30 years
Robert Godwin, X-NH
Edwina Mathews, EM-ER
Harold Rogers Jr., X-DO

25 years
Robert Benjamin, DX-3
Donald Bush, FE-IFMPO
Joaquin Garduno, CIC-7
Peter Herczeg, T-5
Ellen Leonard, NIS-8
Max Maes, ESH-18
Gary Reeves, MST-7
Joseph Repa Jr., NWT-CWPNS
Elsie Sandford, CIC-12
Arthur Sena, CIC-4
Pete Trujillo, CIC-9
Gregory Wentz, CIC-2

20 years
Ronald Aguilar, LANSCE-12
Walter Bast, NMT-9
Charles Bathke, TSA-3
John Borrego, NMT-5
Paul Channell, LANSCE-1
Donna Crook, BUS-5
Joey Donahue, LANSCE-7
Monty Ferris, CST-1
William Grant, BUS-DO
Verna Halloran, HR-7
Allan Hauer, P-24
Ann Hopkins, BUS-8
Joni Hyder, ESH-1
Genara Jaramillo, NIS-5
George Keel, MST-6
Kathleen Kelly, BUS-2
Fabiola Lucero, CST-7
Mike Lopez, MST-8
Larry Maassen, EM-ER
Elaine Martinez, DX-7
C. Jake Martinez, ESH-17
Samuel Montoya, BUS-2
James Moss, ESA-WMM
Leo Sanchez, ESA-DE
Sue Sebring, BUS-5
Wayne Slattery, X-NH

15 years
Terry Bearce, NWT-CMP-PH
Roy Bohn, EM-ER
Gerald Bolme, LANSCE-5
Stephen Depaula, DX-1
E.C. Flower-Maudlin, X-NH
C.A. Gallegos, ESH-1
Roger Goldie, ESH-5
Diane Griechen, HR-5
Lenora Herrera, LC/LRT
James Lamb, CIC-13
Laurie Lauer, MST-CMS
Bruce Lehnert, LS-4
Mary Madrid, X-DO
Esther Martinez, NIS-9
Edward Nettles, S-8
Paul Pan, ESA-WE
James Pecos, NIS-5
Mark Pickrell, NIS-5
Kevin Ramsey, NMT-9
Carmen Rodriguez, CIO
Joseph Roybal, ESA-EPE
Marja Shaner, EM-DOE-FP
Wayne Smith, NMT-6
Ray Stringfield, LANSCE-9
Teresa Trujillo, CIO
Stephen Yarbro, NMT-2
Tresa Yarbro, NMT-4

10 years
C.L. Barrett, ESA-DO-SA
Marilyn Berrigan, ESH-13
Marsha Boggs, TSA-5
Raul Brunner, ESA-WMM
Beverly Chavez, X-DO
Betty Cram, BUS-DO
Rebecca Dilello, HR-5
Joseph Gutierrez, NMT-7
Houston Hawkins, NIS-DO
Willie Haynes Jr., ESH-1
Dolores Jacobs, STB-DSTBP
Matthew Lewis, ESA-EA
Dawn Lewis, ESH-12
Juan Lujan, BUS-4
Mike Marquez, BUS-4
Donald Martinez, P-22
Renee Martinez, S-6
Carol Martz, HR-6
William Miller, BUS-4
Russell Mortensen, P-23
Gay-Ming Moy, NMT-1
Jose Olivares, CST-9
William Partain Jr., TSA-11
Steen Rasmussen, EES-5
Mark Schanfein, NMT-4
Craig Taylor, CST-12
Larry Tellier, EES-8
Rodney Temple, DX-8
Dolores Trujillo, DoD-PO
Alvin Valdez, BUS-4

5 years
Blair Art, NMT-8
David Beddingfield, NIS-5
Paul Bradley, X-TA
Rebecca Chamberlin, CST-11
Steven Croney, S-4
Charles Davis, HR-TI
Kathy DeLucas, PAO
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Robert Kares, X-PA
Maryann Martinez, CST-4
Matthew Martinez, ESA-WMM
Scott Peterson, LS-4
Laura Reynolds, CST-DO

In Memoriam

Joseph B. Mann Jr.

Laboratory retiree Joseph B. Mann Jr. of Los Alamos died July 7 after suffering a heart attack. He was 74 years old. Mann earned a doctorate in physical chemistry from the Massachusetts Institute of Technology in 1950 and was hired by the Lab that same year. During his tenure at the Laboratory, Mann worked in the former RaLa (GMX-5) Group , Radio-chemistry (CMR-4), Inorganic and Physical Chemistry (CMF-4, CNC-4) and Theoretical Chemistry (T-4). After his retirement in May 1986, he returned to the Lab and remained as an active participant in the Theoretical (T) Division until April 1995.

Benito S. Martinez

Laboratory retiree Benito S. Martinez of Los Alamos died June 30. Martinez came to the Lab after serving in the United States Army. He worked as a health protection technician in Chemistry Health Protection (HSE-10) for more than 40 years. He conducted routine and special radiation surveys at TA-55 and was valuable as a trainer for other technicians. Martinez retired in December 1986 but was rehired until June of 1989.

Richard David Heibert

Laboratory retiree Richard Heibert died May 25 of multiple myeloma at his home in Mesa, Ariz. He was 75. Heibert joined the Laboratory as a summer student in 1949 while attending the University of Washington. He received his bachelor's and master's degrees in electrical engineering from the University of Washington. Heibert first worked in the Physics (P) Division Office, later transferring to the former Electronics (P-1) Group, where he worked as a team leader until 1971. Heibert served as group leader in the former Analog Circuits and Devices (E-4) and Computer Systems and Electronic Engineering (E-5) groups. He also worked in the former Digital Electronics and Communication (E-3) and Electronics and Instrumentation (E-7) groups, retiring from the Laboratory in 1982.

Harlow W. Russ

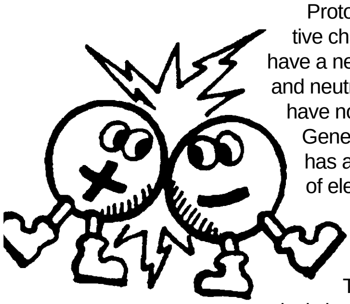
Laboratory retiree Harlow W. Russ died June 12. He was 85. Russ joined the Laboratory in December 1944 as a project member for the top-secret "Project Y," the War Department's name for research and development on the world's first atomic weapon. He left Los Alamos in 1949 and returned a year later, retiring in 1978 from the former Design Engineering (WX) Division. Russ was a consultant at the Lab until 1987. An engineer by profession, Russ was a group leader in the former Mechanical Engineering for Production (Z-6) Group and also worked in the Ordnance (Z) Division, which would become Sandia National Laboratories in the spring of 1948. His account of his work at Los Alamos and the flights from Tinian Island in the Marianas in the Pacific Ocean during World War II were detailed in his book, "Project Alberta: The Preparation of Atomic Bombs for use in World War II." Project Alberta was the code name for the War Department's work on Tinian Island. After World War II ended, Russ worked on Operation Crossroads, the government's post-war atom bomb testing program. Russ graduated from the University of Alabama.

"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.

Opposites attract in a shocking way

Have you ever wondered where lightning comes from, or why your comb sticks to your hair on a dry winter's day, or why your socks stick together in the dryer? To understand the answer to these and other equally shocking questions, you have to know a little about static electricity.

For thousands of years people played with static trying to figure out what makes it work, but it wasn't until the discovery of the atom that this mysterious force was really understood. All matter — any solid, liquid, or gas — is made up of tiny particles called atoms. Atoms are made up of protons and neutrons surrounded by electrons.



Protons have a positive charge, electrons have a negative charge, and neutrons are neutral or have no charge. Generally, an object has an equal number of electrons and protons so their charges cancel each other out. To build an electrical charge, an object must have electrons removed or added to it. Sometimes when certain objects are rubbed together, friction will rub electrons off one object onto another. The object that has gained electrons has an electric charge that is negative. The object that has lost electrons has an electric charge that is positive. Coulomb's law says that charges that are the same repel, opposite charges attract.

In the following activity you will explore the realm of the atom and in the process, learn a little about static electricity. By testing different materials you will see how an object that has gained electrons reacts when placed near an object that has lost electrons.

It is important to note that all static electricity experiments are best done on a dry day, so if it's raining or very humid, skip on to another experiment.

The stuff you'll need

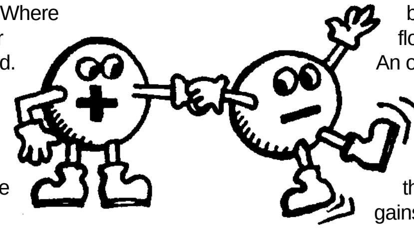
One teaspoon of salt; one teaspoon of pepper; two blown-up balloons; clean hair; a wall; two sheets of paper towel; and a mirror

Here's the plan

1. Raise a balloon slowly to about three inches above your head. Ask your family to describe what is happening to your hair or look into a mirror to see for yourself.

2. Rub the balloon back and forth several times against your hair. Raise the balloon slowly about three inches above your head. Ask your family to describe what is happening to your hair, then look in the mirror.

Why do you think your hair reacted the way it did the second time, but not the first? By rubbing the balloon against your hair you have collected electrons and gathered them onto the balloon. In other words, you have created a negative electrical charge on the balloon. Where you rubbed the balloon, your hair is now positively charged. The basic rule of static electricity is that opposite charges attract, so the negative charge of the balloon is attracting the positive charge of the hair.



3. Hold the second balloon against a wall, then let it go. What happens? Charge the balloon on your hair. Hold the charged balloon against a wall and let go. What happens? If there is no change, charge it again, place it against the wall and let go. Why do you think the charged balloon reacts differently to the wall?

4. Tear up one sheet of paper towel into small pieces and place them on a flat surface. Charge a balloon on your hair. Hold the charged side of the balloon about one inch from the paper and observe what happens. Does the balloon or the paper have more electrons? How do you know? What do you think is making the paper jump?

5. Mix the salt and pepper on a paper towel and use what you just discovered about static electricity to find a way to separate the pepper from the salt.

Wrap-up

When the uncharged balloon is held against the wall it falls because neither the balloon nor the wall have unbalanced charges. By charging the balloon on your hair, you are adding electrons. The balloon's charge is unbalanced and negative. When the negatively charged balloon is put up to the wall, the electrons on that spot are repelled or chased away leaving a small positively charged spot. The remaining protons attract the electrons in the balloon allowing it to stick to the wall. The same thing happens to the little bits of paper-towel. In order to separate the pepper from the salt, you must charge the balloon on a friendly head and sweep it over the mixture. The atoms that make up the pepper are more easily charged than those that make up the salt, so the pepper sticks to the balloon leaving the salt behind.

What's going on here?

Static electricity takes its name from the Greek word elektron, which means amber, a hard yellow rock that is the fossil remains of tree sap. Back around 600 B.C., a Greek philosopher named Thales discovered that if you rub amber with sheep skin, the amber could then be used to attract little bits of grass and feathers. He didn't understand what was going on and when people asked him to explain it, he simply said that it was elektron, meaning amber. It wasn't until almost 2,500 years later that modern scientists discovered that it really was electrons which made static work, only this time, they were talking about the tiny parts of an atom, not the yellow rock!

These days, scientists believe that all matter is made up of tiny particles called atoms. Individual atoms are made up of smaller particles called protons, neutrons and electrons. Protons and neutrons are located in the center of the atom in the nucleus. Electrons make up the outer part of the atom in a fast moving cloud.

Rubbing two objects together sometimes causes static electricity. It is static because the electricity doesn't flow (static means standing still). An object that has lost electrons must try and pick some up to be balanced again. The shock you may get from static electricity happens when the object that had lost electrons gains them back. The charge jumping from one object to another causes the shock. Sometimes you may even see a spark when this happens! When you rub the balloon on different objects around the room, you find that only certain materials are good at giving up electrons. In general wool carpets work well as do your dog and cat. Cotton and most synthetics don't do too well and things like rubber and amber actually work to take spare electrons in!

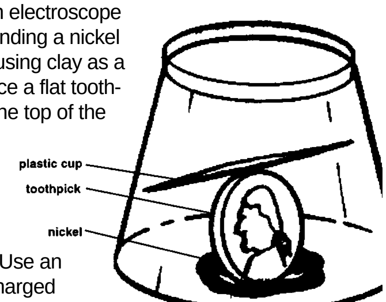
Where does this happen in real life?

When most people think about static, they usually only think of the negative aspects of the force. While it is true that electrostatic attraction leads to the inconvenience of sweater head (when your hair sticks to your wool sweater) and sticky socks, there are some practical uses of the phenomenon. When you make a photocopy on a machine which uses "dry toner," it is static electricity which pulls the ink up out of the reservoir and sticks it to the surface of the paper where hot rollers "fuse" it on. Electrostatic precipitaters, otherwise known as "scrubbers," use static electricity to reduce air pollution. These devices sit at the top of tall smokestacks and as dust and dirt particles rise, static charges make them stick to an oppositely charged plate rather than go into the air.

Now try this

Try these experiments in a dark room. You may be able to see sparks! Try using different objects and fabrics to charge the balloon. Experiment to find out which are electron donors and which are electron grabbers.

Set up an electroscope model by standing a nickel on its edge, using clay as a stand. Balance a flat toothpick across the top of the coin. Cover the nickel and toothpick with a plastic cup (diagram 1). Use an electrically charged balloon to move the toothpick without lifting the cup. Talk about how to do it. Why do you think you are able to move the toothpick?



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This month in history

September

1620 — The Mayflower sails from Plymouth, England, with 102 passengers aboard

1692 — Don Diego de Vargas leads the bloodless reconquest of Santa Fe

1821 — Capt. William Becknell leads the first successful trading expedition along what became known as the Santa Fe Trail

1944 — The decision is made to select the Alamogordo Bombing Range for the test firing of an implosion-type nuclear weapon

1945 — The Japanese formally surrender aboard the USS Missouri

1949 — President Truman announces that the Soviet Union had tested an atomic bomb

1952 — The Livermore branch of the UC Radiation Laboratory (later known as Lawrence Livermore National Laboratory) opens

1964 — The last of the original Lab areas in down Los Alamos is razed

1970 — Harold Agnew becomes the Laboratory's third director

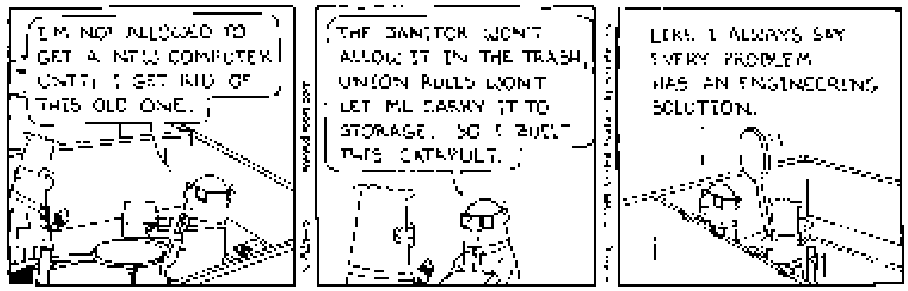
1982 — The National Institutes of Health selects a proposal from the Lab and a private company to create a DNA databank, which becomes GenBank

1988 — US and Soviet scientists conduct an underground nuclear test at Semipalatinsk in the USSR as part of the Joint Verification Experiment

1991 — The DOE Tiger Team arrives at the Laboratory

1995 — Lab researchers complete a physical map of Chromosome 16

DILBERT® by Scott Adams



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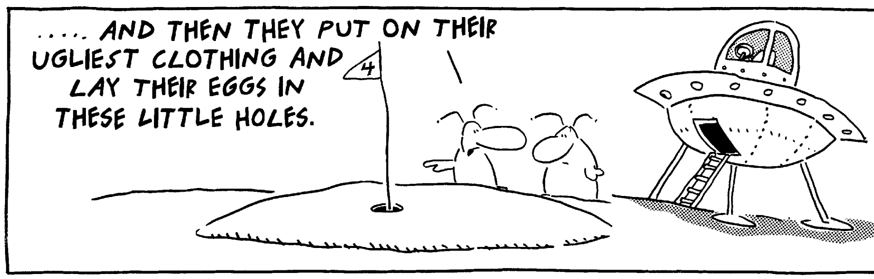

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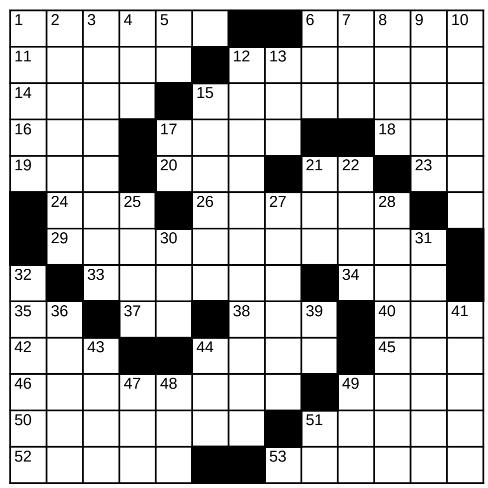
The Final Frontier



ACROSS

1 Type of galaxy (followed by No. 32 down)
6 "The — of Heaven" by LeGuin
11 — Island
12 Describing a person who has lost the ability to read
14 Early Laboratory satellite program
15 Abstruse; confidential
16 Consume gradually as by erosion
17 Voice range
18 Epoch
19 National Security Information (abbrev.)
20 High, rocky hill
21 One of the Kettles
23 Steamship (abbrev.)
24 Large flightless bird
26 Capital of Tasmania
29 " — Moon," 1950 sci-fi flick
33 Moon of Mars
34 Soul (Fr.)
35 Man's nickname
37 About
38 Space station
40 Swelling on a plant
42 Woman's nickname
44 Incline, lean
45 Past tense of eat
46 Exposes
49 Vice president who killed a rival in a duel
50 Moves clumsily
51 Indiana senator
52 "While memory holds — — In this distracted globe." Hamlet (2 words)
53 Incautiously

ACROSS

1 Number of original astronauts
2 Tickled, delighted
3 Inopportune
4 Long, narrow, wedge-chaped inlet
5 Chemical symbol for arsenic
6 Allow
7 Chopping tool
8 Fatigue
9 Splitting —
10 Cover completely
12 Those who dream of "untriangulated stars," according to E.A. Robinson
13 Old card game
15 Local or minor divinities of ancient Canaanites and Hebrews
17 Preposition
21 Exactly suitable
22 Song
25 — Group
27 Depressions in the Earth's surface
28 Discoverer of Pluto, later a New Mexico State University professor
30 Deadlock
31 Without charge
32 See No. 1 across
36 Planet
39 Abbreviation for a thoroughfare
41 Site of "Bloody Sunday" in Northern Ireland
43 W. Coyote's main supplier
44 By means of
47 Ruler of any of several African tribes
48 One who served in the Armed Forces
49 Clear away tables
51 Note on scale

August solution

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			I	C	I	N	E	S	S			
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spotlight

Harold Trease

Coast to coast in 10 days by bicycle

by Ternel N. Martinez

Okay, we'll skip the usual "What would possess anyone to do this?" and "He must be absolutely crazy" platitudes and get straight to the fact that Harold Trease, a computational physicist in Hydrodynamic Methods (X-HM), entered the 1998 Race Across America bicycling event.

Whether you agree with Outside magazine's calling RAAM the "world's toughest event," or think that some other event should be given that distinction, any time an event is even considered among the world's toughest, it deserves respect. But for the record, Outside magazine ranked this event above such stalwarts as the U.S. Army Best Ranger Competition; Vendee Globe Around-the-world Sailing Race; Hawaii Ironman Triathlon; Iditarod Dogsled Race; and Badwater 146-mile Cross-country Run, among others.

The 1998 RAAM is a 2,907-mile trek that began in Irvine, Calif., and ended in Savannah, Ga. It covered 57 cities — including seven in New Mexico — across nine states. Elevations range from 100 feet below sea level to 8,650 feet above (which, interestingly, is at Cloudcroft, N.M.)

Which brings us to Trease, a 20-year Lab employee who has been racing competitively about four years. He's into any race that takes longer than a day to complete. In fact, on Labor Day 1997, Trease won the Bicycle Across Missouri event. That race took him about 34 1/2 hours to complete in 95-degree days coupled with 95 percent humidity. "Whenever I compete, I sometimes drink as much as a gallon of water an hour," he said, smiling. "In Bicycle Across Missouri, I drank 27 gallons of water — and only gained one pound." Trease weighs only 140 pounds anyway.

But BAM was only a 576-mile race, and that's the longest race Trease had ever competed in up to then. RAAM is more than five times that distance. So months of endurance training lay in store for him.

That training included riding in long loops through Cuba, Española and Abiquiu; riding 80 miles a day during the week, 200 miles on Saturday and 150 miles on Sunday; and riding in the Deming and Las Cruces areas to acclimate his body to desert heat. Trease said his training in many high-altitude areas also gave him an advantage.

But just as important as the physical training was training his body to perform well on only two hours of sleep per day. "Sleep deprivation is a major component of the race. Most competitors don't train their bodies in sleep deprivation beforehand," said Trease, adding he normally went to bed and slept between the hours of 3 and 5 a.m., and that being able to ride on only two hours of sleep provides a tremendous competitive advantage. Remarkably, Trease said the sleep deprivation had little effect on him at work.

July 23 finally arrived. It was now time to see if the months of training in desert heat and sleep deprivation had paid off. His 12-member team rode along with him in four different vehicles plus a recreation vehicle, providing Trease with liquid food and water, monitoring his vital signs, letting him know how he was doing with respect to the other racers, washing clothes and otherwise making sure he didn't get lost.

After the first day, Trease was in fifth place. By day four, however, he had slipped into 11th place, partly the result of a crash that bruised his hip and possibly fractured his collarbone. While his attending physician gave him the okay to continue, Trease could not raise his right arm above his shoulder. He also was having trouble staying awake. The team brought in his sister to talk to him and help keep him focused.

Over the next few days, Trease gradually crept up in the standings and was in eighth place by late evening on July 30. But eventually, other racers caught up and passed him. In the end, Trease would complete the race in 10 days, six hours and 40 minutes, 42 hours and 20 minutes behind the first-place finisher. Trease finished in 11th place overall, good enough to earn him the coveted RAAM gold medal, awarded to all riders who complete the course within 48 hours of the first place bicyclist.

Despite his accident early in the race and riding the majority of the trek in discomfort, Trease never lost his trademark smile. And he apparently left a distinct impression on RAAM organizers. "Trease was consistently the happiest rider throughout the race, never a complaint on his lips," they stated in their Web site.

Additional information on RAAM is available at http://www.raamonline.com/ on the Web. Information on Team Trease can be found on the Web as well, at http://www.unm.edu/~karenann/index.html. Information on long-distance cycling events can be found on the Ultra-Marathon Cycling Web page at http://www.ultracycling.com/.

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