

Reflections

Los Alamos National Laboratory

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Women in our Workplace



About the cover ...

This month's cover, illustrating the wide variety of jobs held by women at the Lab, was prepared by photographer Fred Rick and illustrator Ed Vigil. The women shown at their workplaces, beginning at the upper left corner and proceeding clockwise, are Ruth Holt of CIC-1, Tamara Johnson of CST-4, Virginia Herrera of NIS-4, Beverly Martin of CIC-12 on assignment to CST-18, Jane Gladson of NMT-4, Jenny Vigil of BUS-4 and Stephanie Maez of PA-1.

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Reflections

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editor's journal



Time will tell

While working on this latest issue of "Reflections," which highlights the Women's Diversity Working Group and mentoring efforts for women at the Lab, I couldn't help but think how "the face" of management at Los Alamos has changed somewhat since I joined in 1989.

Sure, the number of women and minorities in positions of "power and influence" at this national facility are not what many of us would like it to be, considering the makeup of the country. But I must admit, in recent years I have noticed a concerted effort on the part of some to make the Lab's management a bit more diverse.

Still, it was quite a culture shock nearly eight years ago when I first skimmed the Lab's management chart and found no women in top management positions. (I previously worked for an organization in which all the "power" positions, except for two, were held by women.) As I recall, in 1989, none of the Lab's associate directors (who then made up the Lab's senior management group) were female. If there were women who wielded power and influence at the senior-most management levels — and there very well may have been some — they were not apparent to the casual observer. That is to say, I was not aware of them.

Fair or not, the message I got at the time was that upper management at the Lab was a male province in which a woman's role predominantly was that of worker bee. True, many women — and many men — in technical, professional and administrative positions have no interest whatsoever in being a manager, senior or otherwise. But at the time, it struck me as strange that despite the women's movement having peaked across the country, women were nearly invisible at the Lab's upper management levels.

But time brings change, and if we're lucky, it's change for the better. While the Lab still has no permanent female director of a technical division, more women have joined the senior management ranks. A quick look at some numbers supplied by the Lab's Diversity Office confirms this observation.

In 1989, there were 24 individuals in "Top Management" positions, which included director, deputy director, associate director, center director, controller, Lab counsel and their deputies. None of these positions were held by a female. Under the heading "Associate Management," which included division leaders, office directors, program directors, test directors and their deputies, eight females were listed out of a total of 97. Group leaders that year included 48 females (18 staff members; 30 administrative staff members) out of 444.

Stats from the end of 1996 indicate some progress has been made. Females held six of 62 "Top Management" positions ("Top Management" titles being director, deputy director, division director, program director, office director, Laboratory counsel, director of institutional development and their deputies). The "Associate Management" category has been dropped, but the "Group Leader" category shows that females held 65 of the 376 group leader positions (40 technical staff members; 25 specialist staff members).

The increase in the number of female managers at the Lab, especially senior managers, is by no stretch of the imagination awe inspiring. But I do think it's a noticeable step in the right direction.

Will women continue to move into and up the management ranks at the Lab? Will the proverbial glass ceiling that has stopped highly competent women in professions across the country shatter or at least crack here at Los Alamos? I really don't know, but I do think continued progress is possible if we don't rest on our laurels and actively work to ensure that everyone gets her (or his) fair chance. But as they say ... time will tell.

Expanding your horizons

by John A. Webster

Since it began at the College of Santa Fe nearly 20 years ago, thousands of high school and middle school girls across Northern New Mexico have been introduced to science and math as career possibilities through the Expanding Your Horizons conferences.

This year's conference, scheduled for March 20 at the Laboratory, is expected to attract approximately 100 girls in grades 8 through 10. They will participate in hands-on workshops with women who work in a variety of scientific and technical fields at the Lab and elsewhere.

The first EYH conference was held in 1980 at the College of Santa Fe because it had adequate facilities and seemed to be centrally located for many of the participants, recalled Gloria Cordova, group leader for Conference and Visit Management (PA-4) and a member of the first steering committee.

From the beginning, the program has been received enthusiastically by the more than 13,000 participants. "They are excited and energetic," Cordova said. "I remember one wrote on an evaluation form: 'I never knew women did these things.'"

Joyce Guzik of Thermonuclear Applications (XTA), co-chair with Shirley Herrera of Business Information Systems (CIC-13) for this year's conference, said the program began because women in technical professions saw a need.

"This is a time in a young woman's education when she is making important career and college preparation decisions, and it can make a difference for her to be aware of opportunities that she may not have thought about before," Guzik said. "It's important for these students to realize the possibility of a career in science."

The conference is conducted by Los Alamos Women in Science, an organization that provides support and assistance for women in scientific and engineering careers and provides mentors and role models for young people. Other support is given by the New Mexico Network for Women in Science and Engineering, by a number of private firms and by organizations around the Laboratory.

Guzik said each student can participate in two workshops, one in the morning and one in the afternoon. Workshops are planned in such areas as computer science, life sciences and physical sciences, she said. Each one will be about one hour and 15 minutes long, and they will be limited to about eight girls so that each one can have a chance to participate actively.

While the students are participating in the workshops, the teachers and mentors who accompany them from their schools will attend other activities and science demonstrations.

All the young women also will participate in a team activity and have the opportunity to hear speakers discuss general subjects of interest. Guzik said the team activity this year will be an "egg drop," in which the participants will build egg-cradling containers that they hope will prevent the eggs from breaking when dropped from various heights.



Above: Kathleen Ramsey of the Wildlife Center in Española holds Roberta, a bobcat who joined Ramsey at the 1994 Expanding Your Horizons conference.

File photo by James E. Rickman



Left: Karen Schultz Paige of Environmental Systems and Waste Characterization (CST-7) and Shevonne Romero of San Diego Mission School investigate lasers and light during a workshop at the 1996 conference.

File photo by Fred Rick



Paige helps Veronica Grace, left, of Capital High School and Tammy Martin of St. Michael's High School, center, during a laser optics workshop in 1994.

File photo by LeRoy N. Sanchez



Kelley Mallette of Las Vegas Memorial School tests water for its oxygen content during the 1994 conference.

File photo by LeRoy N. Sanchez

bus report

TIPS to improve procurement

by Ternel Martinez

The Business Operations (BUS) and Computing, Information and Communication (CIC) divisions recently took a major step in developing a paperless procurement system by awarding a contract to American Management Systems to help the two organizations develop a customized software package, called the Total Integrated Procurement System.

The process for determining what the software package needed to do to improve procurement began about a year ago. That's when BUS formed focus teams of buyers and representatives from several groups in BUS that deal with procurement in some fashion, such as accounts receivable/payable and receiving.

In addition, BUS received input from others, including the Nonproliferation and International Security (NIS), Accelerator Operations and Technology (AOT) and Dynamic Experimentation (DX) divisions, the Science and Technology Advisory Committee, the Product Development/Product Evaluation Committee and several vendors.

Dave Delaney of Procurement (BUS-5) and TIPS project leader in BUS Division said AMS, based in Fairfax, Va., was chosen to help BUS and CIC develop TIPS because its desktop software package best met the defined requirements of the Lab's customers and buyers.

"AMS has a proven track record in providing state-of-the-art, automated procurement solutions for such entities as the U.S. Patent Office and the Canadian government," he said. "When completed, TIPS will significantly reduce procurement turnaround times and process costs and improve vendor performance monitoring."

Specifically, he continued, TIPS will allow requestors to submit all types of

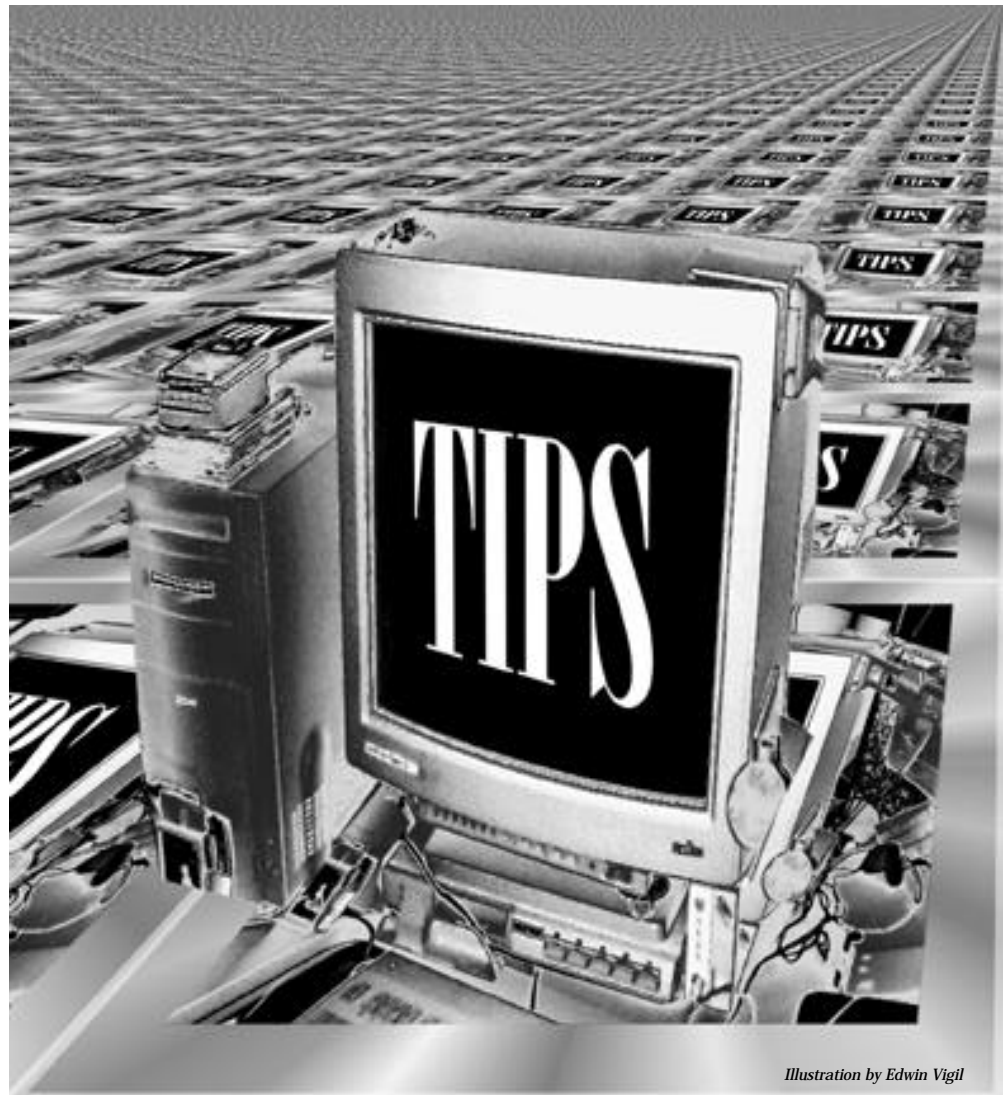


Illustration by Edwin Vigil

requests online and buyers to perform all other procurement functions online as well. Other benefits will include online guides instructing requestors which procurement venue would best suit their needs (for example, purchase card, just-in-time or regular purchase request), how to correctly fill out those forms and the ability to monitor the status of a request online.

"We understand how important the procurement process and systems are to the successful execution of programs and projects within the Laboratory. We're excited by the anticipated improvements TIPS will make to the procurement process," he added.

He also emphasized that CIC and AMS currently are exploring the use of a World Wide Web interface that will allow requestors and buyers to access the new procurement system on any computing platform.

Complete information on TIPS, including the names of those involved in the project, implementation plans, strategies and the joint application development reports, is available online at <http://www.bus.lanl.gov:8001/bus/business/tips/tips.html> on the World Wide Web. Adobe Acrobat Reader is required. For more information on TIPS, contact Delaney at 7-8583.

Students get an explosive demonstration

by Steve Sandoval

"Have explosive demonstration kit, will travel." That could be the motto of Mary Campbell of High Explosives Science and Technology (DX-2).

Campbell periodically takes small wood blocks, several grams of high explosives, heavy cylindrical steel containers, matches, black powder, which is used in firecrackers, and her see-through Lexan assemble-on-the-fly kit, in which she conducts her demonstrations, and responds to invitations from area schools to, as she puts it, teach children to have "a little respect for what small amounts of explosives can do."

Campbell, a chemist at the Lab for 20 years, is one of several DX-2 employees who participate in this kind of community outreach. One of her most recent demonstrations was for 22 sixth- through eighth-grade students from the New Mexico School for the Deaf in Santa Fe who came to the Lab.

Schools in Los Alamos and Santa Fe have seen Campbell's demonstration, and a once-a-year kindergarten through sixth-grade program called "Careers and Curiosity in Math and Science" has been used to show what a bang a few milligrams of an explosive commonly found in the home can make. The program is sponsored by the American Association of University Women in partnership with the Lab and Los Alamos Public Schools.

A component of the "Women in Science" career day called "Expanding Your Horizons" includes a workshop about explosives that Campbell also teaches, she said. This career day encourages young women to consider a career in science and engineering and is sponsored by the New Mexico Network for Women in Science and Engineering.

"I think children watch cartoons and think that all explosives do is burn their fingers," said Campbell. "They think it isn't so bad."

But Campbell is quick to dispel that myth, explaining that as little as a half-gram of a high explosive called PETN, which is primarily used in detonators, can turn a small wood block into instant toothpicks.

She places the wood block in the steel container and uses a fuse to set off the high explosive. The student observers, on this occasion, were amazed by the explosive's power.

Campbell usually begins her demonstration by showing students viewgraphs that explain what explosives are — essentially materials that react very fast and produce energy and large amounts of gas — how an explosion starts and the molecular process of an explosion.

She also shows photographs of explosives tests at the Lab, quick to point out that employees taking part in the



Teacher Margie Propp, center, reacts to an explosives demonstration while her New Mexico School for the Deaf middle school students also watch. Mary Campbell of High Explosives Science and Technology (DX-2), at left, conducts demonstrations on the hazards and benefits of high explosives. Photo by Fred Rick

experiments are far away, or in protective concrete bunkers. "During explosives experiments at the Lab, safety is a serious consideration," Campbell tells the students.

Another important point, Campbell tells students, is to make sure to have a bucket of water nearby when using fireworks.

To illustrate the ignition stimulus necessary to start the explosives process, Campbell takes a match, places the match head on top of a steel block and strikes it with a hammer. The match ignites because of the force of the hammer and friction, Campbell explains.

Next, Campbell burns a string coated with some black powder and partially wrapped with tape; it looks and smells like a firecracker.

A fuse with a black powder core is attached to a cap containing a half-gram of black powder and fit into a hole in a wood block. The explosion makes a loud noise but doesn't break the wood block. One NMSD student likened the bang to the popping sound of a firework. "It smells like fireworks," another student told Campbell through an interpreter.

"Explosives are very useful if you want to move things, like if you want to build a road and have to move rock," said Campbell.

However, as Campbell passed around a piece of shrapnel, a fragment of a piece of steel pipe destroyed in an explosion, she reminded students that explosives can cause serious damage.

"You may think you know what the experiment will do, but you have to carefully observe to find out what really happens," said Campbell. "With all but the tiniest amounts of explosives, the observer must be protected and observed by mirrors and cameras."

March is Women's History Month



Judith Mourant



Kathleen Jackson



Ines Triay



Bill McKerley



Ron Conrad



Rebecca Phillips



John Phillips

Outstanding mentors

by Ternel Martinez

When the Women's Diversity Working Group first formed a little more than a year ago, it set out to formally identify, evaluate, select and prioritize the most significant issues facing women at the Lab. The top four issues chosen were mentoring, career development, recruitment and dependent care, with mentoring having the highest priority.

While one subcommittee in the WDWG currently is in the process of developing a formal mentoring program for women, another subcommittee — the career development subcommittee (a combination of the upward mobility and glass ceiling subcommittees) — decided to create an award program recognizing and applauding those who already mentor women at the Lab, either on a formal or informal basis.

Thus, seven Lab employees recently were recognized for their outstanding mentoring efforts in the inaugural 1997 Career Development Mentor Awards Program. Although the person being mentored had to be a woman, both men and women were eligible for the award.

The winners are Judith Mourant of Bioscience/Biotechnology (CST-4); Kathleen Jackson of the Computing, Information and Communication Division (CIC-DO); Ines Triay of Environmental System and Waste Characterization (CST-7); Bill McKerley of Inorganic Elemental Analysis (CST-8); Ron Conrad of Hazardous and Solid Waste (ESH-19); Rebecca Phillips of the Human Resources (HR) Division; and John Phillips of the Nonproliferation and International Security Division (NIS-DO).

As of this writing, an awards ceremony is scheduled from 5:15 to 7 p.m. March 10 in the J. Robert Oppenheimer Study Center. Director Sig Hecker is scheduled to be on hand to present the winners with their Outstanding Mentoring Award plaques.

Subcommittee chair Alice Naranjo said when the call for nominations first went out late last September, she expected only about 20 responses. Instead, the subcommittee received 50 nomination packets. In fact, some nominees received multiple nominations.

Naranjo added the screening process was especially difficult. "The nominations were so strong, we wanted to give everyone an award," she said.

Fellow subcommittee member Carla Jacquez said the number of awards to be given this time actually increased from five to seven because of the quality of the nominations.



Women's Diversity Working Group

by Steve Sandoval

The Laboratory's Women's Diversity Working Group is only one year old, but it already counts many successes.

The 12-person committee has formed several subcommittees to deal with the issues of mentoring, recruitment, career development and dependent care, according to its outgoing chairperson, Gail Diedrich of the Science and Technology Base (STB) Programs Office.

Diedrich said the group among other things researched the development of a Women's Research Center at the Lab, has participated in Diversity External Advisory Council meetings, endorsed the half-day science

'Women Helping Women'

by Steve Sandoval

In today's modern work world where women and minorities are struggling to compete, the odds against succeeding sometimes seem insurmountable. Sometimes you have to work harder, experiment or try new approaches to solving problems.

At the Laboratory, a group of women employees in the Science and Technology Base (STB) Programs Office formed Women Helping Women to support and encourage women in their careers by fostering personal and professional development, said Gail Diedrich of STB.

Women employees of STB voluntarily can join the group, said Diedrich. Women Helping Women has a code of behavior and developed a mission statement, goals and objectives, she said.

Since the group formed in November 1994, two STB employees used their increased skills and self-esteem to change fields and earn promotions at the Lab, said Nadine Shea of Nuclear Weapons Technology (NWT) and a former STB employee.

Diedrich represented the Lab at a New Mexico First Town Hall meeting on strategic planning for the state's future last summer in Taos, while Kay Coddens, also of STB, used the team-building and self-confidence skills acquired through the group to

be a guest speaker at a "Women In Science" symposium last October.

Women Helping Women is in the process of creating a home page on the World Wide Web for more online information.

Some group members also plan to help the Lab's Women's Diversity Working Group to prepare and sponsor activities for Women's History Month (see accompanying article).

Women Helping Women actually came out of a conference Warren "Pete" Miller, the Lab's acting deputy director for science and technology, attended. Miller was STB director at the time; he met with some women scientists across the lab, and administrative staff of STB to hear from them what kinds of problems they were encountering at the Lab, Diedrich recalled.

As a result of these meetings, Diedrich and Becky Dilello, also of STB, decided to schedule a meeting of women employees at STB. The response was overwhelming, Diedrich said.

"It sounded to me like we were blaming others for all

our problems," Diedrich summarized the outcome of the initial meeting with STB administrators. "We thought there must be some things we can do."

At the monthly Women Helping Women meetings, one STB member acts as chairperson; she sets the meeting agenda, schedules guest speakers and/or facilitators and generally runs the meeting, said Diedrich.

"A lot of women in this group had never led a meeting," Diedrich said. "They have found that they can do it. It is a very satisfying, rewarding experience."

Last September, Jennifer Siders of Electronic and Electrochemical Materials and Devices (MST-11) talked to Women Helping Women about "Gender Gap in College Admission Tests." Siders had spoken about the topic at an American Physical Society convention and felt it would be applicable for Women Helping Women.

"I wish I could attend their meetings all the time. I wish more divisions had them," Siders said. "They're really useful and informative seminars," she said of the monthly meetings. "It's nice being in a roomful of women once a month instead of men."

And while Women Helping Women counts several successes, it hasn't always been easy. "The group has struggled because we are diverse," said Diedrich.

But Shea and Diedrich are impressed by how STB women employees have become more self-confident through Women Helping Women.

"The best thing about the group is that participation is voluntary, and we create our own agenda," said Shea. "We're all there because we want to be there; the interaction has value for us, both personally and professionally."

'A lot of women in this group had never led a meeting. They have found that they can do it. It is a very satisfying, rewarding experience.'

Bivens named HBCU administrator



Pamela Bivens

Pamela Bivens is the Laboratory's new program administrator for Historically Black Colleges and Universities.

The program is part of the Science and Technology Base/University Programs (STB/UP) Office.

The Historically Black Colleges and Universities program at the Lab focuses on ensuring that students and faculty of under-represented groups in science and technology have a place within their chosen fields of study.

The HBCU program offers internships for students to conduct summer and year-long research with Lab scientists, said Bivens.

"I feel that my career has brought me to this point where I am in the capacity to serve students and faculty at historically black colleges and universities," said Bivens. "My vision for this program is to position the Lab as the premier national lab for recruiting students and faculty from historically black colleges and universities."

Bivens earned her bachelor's degree in mass media arts from Hampton University. She also has a master's degree in education and human development from George Washington University.

Bivens can be reached at 5-7692 or at mail stop F673. She is located at Technical Area 3, Building 406, across the street from Occupational Medicine (ESH-2).

Petrovic garners James I. Mueller Memorial Award

John Petrovic of Ceramic Science and Technology (MST-4) received the American Ceramic Society's James I. Mueller Memorial Award.



John Petrovic

Petrovic accepted the award at the Engineering Ceramics Division's 21st annual conference on Composites, Advanced Ceramics, Materials and Structures in January in Cocoa Beach, Fla.

The award is the highest granted by the Engineering Ceramics Division of the American Ceramic Society. It signifies outstanding ceramics research and significant contributions to the Engineering Ceramics Division.

At the Florida meeting, Petrovic also presented the Mueller Memorial Lecture on "High Temperature Structural Silicides" to the starting Plenary Session.

Petrovic is the current trustee of ACS' Engineering Ceramics Division.

Petrovic has been at the Lab 22 years. He has bachelor's, master's and

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Darryl Butt receives ceramics award

Darryl Butt of Materials Technology/Metallurgy (MST-6) has received the American Ceramic Society Award for young scholars.



Darryl Butt

The Robert L. Coble Award for Young Scholars is named after the late Massachusetts Institute of Technology professor, whose enthusiasm and creative energy were directed toward putting the field of ceramics on a sound scientific foundation.

The award recognizes Coble's lifelong mission to enhance the achievement and advancement of young ceramic scientists. The annual award recognizes outstanding scholarship in an individual under the age of 35.

Butt, leader of the corrosion and interfaces team in MST-6, was recognized for his research, both experimental and theoretical, in gas-solid reactions, diffusion, thermodynamics and laser diagnostics. The award will be presented formally to Butt at the annual meeting of the American Ceramic Society in Cincinnati in May.

Butt has worked at the Laboratory since April 1991. He joined the Lab as a postdoctoral candidate in the Nuclear Materials Technology (NMT) Division.

Butt has a bachelor's degree in ceramic science and engineering and a doctoral degree in ceramic science, both from Penn State University.

Laboratory technology captures Popular Science readers choice award

Technology developed by Craig Taylor of Organic Analysis (CST-12) and Dennis Hjeresen of the Environmental Management (EM) Programs Office recently won the Readers Choice Award from Popular Science magazine for the top achievement in science and technology.

The annual award lets Popular Science magazine readers vote online on the magazine's World Wide Web page.

Taylor and Hjeresen share the award with Hughes Environmental Systems Inc., a subsidiary of Hughes Aircraft Co., which is commercializing the technology that could revolutionize the dry cleaning industry worldwide.

In November, the technology received a "Best of What's New" from the magazine for the system, which replaces harsh dry cleaning chemicals with a liquid carbon dioxide cleaning process.



Dennis Hjeresen



Craig Taylor

Obituaries

Patrick Sanchez

Patrick Sanchez, 35, of Dixon died Jan. 13. Sanchez worked as a machinist in Materials Technology: Metallurgy (MST-6) from September 1980 through February 1996.

Survivors include his parents, Alfonso and Dila Sanchez of Dixon; sisters, Margaret Romero of Española, Kathy Sanchez of Dixon and Lisa Sisneros of New Braunfels, Texas.

Fredrick John Humphry



Fredrick John Humphry

Fredrick John Humphry, 66, of Los Alamos died Jan. 16.

Humphry worked in the Accelerator Operations and Technology (AOT) Division for 18 years before retiring in 1994.

He is survived by his wife Emily; one daughter and one son all of Los Alamos; a daughter in Boise, Idaho; two sons on Long Island, N.Y.; a brother in Newport News, Va.; and mother in Long Island, N.Y.

February employee service anniversaries

30 years

Gary Powley, DX-7
Seferino Vigil, ESH-1

25 years

James Elliott, EES-5
Michael Martinez, ESH-4
Alex Marusak, NIS-8
Linda Mullins, ESA-FM-ESH

20 years

Hassan Dayem, CIC-DO
John Flower, CIC-9
Anthony Garcia, EES-1
Larry Glick, CST-3
Wayne Hansen, EES-15
Orval Hart Jr., ESA-TSE
Robert Holder, BUS-5
Norma Jorgensen, NWT-PO
Jack Markin, NIS-DO
Geraldine Martinez, EES-4
Norman Mayne Jr., FSS-21
Bill McCormick, ESA-FM-ESH
Lois McFarland, HR-5
Robert Naranjo, CIO
Valarie Prestwood, CIC-13
Ronald Rabie, DX-2
Yvonne Salaz, QP
Luis Salazar, NWT-PO
Ted Spitzmiller, CIC-6
James Stine, DX-2
Gary Sullivan, DX-6
Pamela Ulibarri, TSA-9
Yolanda Valdez, LS-4
Laurance Warner, AOT-9

15 years

Jacobo Archuleta, NIS-4
Diana Armijo, AA-3

Ricky Baros, CST-7
Connie Butters, NWT-PO
Larry Byars, EM-ER
George Faulkner, P-24
Brad Gallimore, ESH-5
Gerald Galusha, DX-5
Kay Grady, TSA-3
Virginia Hamilton, CST-11
Brosl Hasslacher, T-13
Victor Hogsett, NIS-8
Michael Loibl, ESH-1
David Martinez, ESH-1
Paul Maudlin, T-3
Benjamin Montoya, NIS-6
Thomas Norris, TSA-7
Larry Pacheco, ESH-1
Virginia Rey, ESH-12
Richard Salazar, NMT-6
David Sanchez, ESH-14
W.K. Scarborough, MST-4
Richard Wood, AOT-1

10 years

Mark Backus, BUS-5

5 years

Angela Cantu, AA-IEO
Michael Duran, ESH-1
Mary Gobby, CST-26
Michael Johnson, CST-8
David Kilcrease, T-4
John Lyles, AOT-5
Glenn Olah, CST-4
Gregory Rand, ESA-TSE
Jeffrey Roberts, CST-12
Dianne Roybal, NIS-7
Matthew Sanchez, ESH-3
Donald Shired, CIC-13
Annette Swift, HR-5
Thomas Terwilliger, LS-8

Petrovic garners ...

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doctoral degrees in metallurgy from Case Western Reserve University in Cleveland, Ohio. Petrovic also is a Lab Fellow and a Fellow of the American Ceramic Society and the American Society for Materials International.

Trewhella named member of study section

Jill Trewhella of Bioscience/Biotechnology (CST-4) has been selected as a member of the Molecular and Cellular Biophysics Study Section, Division of Research Grants, for the National Institutes of Health.

Trewhella's appointment is through June 30, 2000.

Members are selected based on their demonstrated competency and achievement in their scientific discipline as evidenced by the quality of their research accomplishments, publication in scientific journals and other scientific activities and achievements.

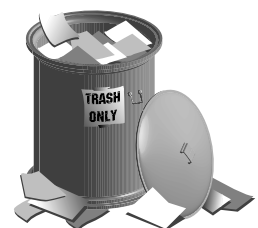
Study sections review grant applications submitted to the National Institutes of Health and make recommendations on the applications to the appropriate national advisory council or board of the institute. The study sections also survey the status of research in their fields of science.



Jill Trewhella

Did you know...

**There are 370
trash dumpsters
at the Lab.**



science fun

"Science at Home" is a publication developed by Science Education Programs (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.

Eggshell architecture

You're walking along carrying a dozen eggs when all of a sudden, SPLAT! The kitchen floor is covered with the makings of an omelette that would make Humpty Dumpty proud. How can a chicken egg be so fragile when it hits the floor, but so strong when resting under a chicken?

In this activity, you will learn the role that the shape of an object plays in controlling its strength, and in the process, draw some conclusions on how forces can be managed so that bridges and buildings can hold the load.

The stuff you'll need

Six to 12 raw eggs, a dozen or more books to use as weights, a bathroom scale, masking tape, a butter knife, a bowl, a flat surface protected with newspaper, a ruler and a pencil.

Here's the plan

1) Use the method below to crack the eggs. You will need four round end shells and four pointed end shells for each trial.

How to break an egg and save the shell

a) Hold an egg up on end. Use a pencil and ruler to mark the midpoint. Hold the pencil point gently against the shell at the midpoint. Slowly rotate the egg so that a line is drawn around the middle of the egg. Place two pieces of masking tape around the egg, one on each side of the middle line (diagram 1).

b) Use the blade of a butter knife to tap along the middle line between the pieces of tape.

c) Once you have cracked the entire center, hold the egg over the bowl and slowly open it letting the insides drop out.

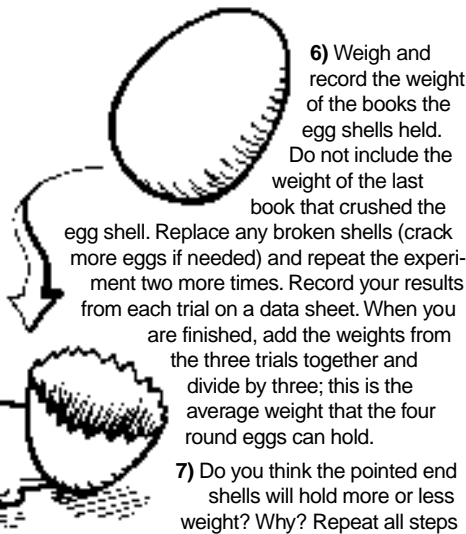
d) Refrigerate the raw eggs for future use.

2) Place the round ended shells, with the cracked edges down, on a flat surface.

3) You will be placing books on top of the shells, so adjust them so that each one fits about a half inch from the corner of the first book. Predict how many pounds of books, if any, you think the shells will hold without breaking.

4) Place the first book flat on the eggshells (diagram 2).

5) Continue adding books, keeping them as centered as possible, until one of the egg shells is crushed.



6) Weigh and record the weight of the books the egg shells held. Do not include the weight of the last book that crushed the egg shell. Replace any broken shells (crack more eggs if needed) and repeat the experiment two more times. Record your results from each trial on a data sheet. When you are finished, add the weights from the three trials together and divide by three; this is the average weight that the four round eggs can hold.

7) Do you think the pointed end shells will hold more or less weight? Why? Repeat all steps using the pointy eggshells. Predict how many books they will hold. Be sure to record your results. Repeat the experiment three times, and then come up with an average.

What's going on here?

Because eggs are easily broken, most people don't realize just how strong an eggshell can be. The staff at the Ontario Science Center in Toronto demonstrated that a single egg standing on end can support a 90 Kg (200 pound) person. The secret behind this strength is the way the shape of the shell transfers the forces acting on it. All objects that support weight are in a constant battle with the force of gravity. An object's weight is equal to its mass multiplied by the force of gravity. On Earth's surface, gravity is always pulling things toward the center of the planet, so the more weight resting on an object, the greater the force acting on the object.

Scientists call this action compression.

In some objects, the ability to withstand compression is due to a strong, fairly rigid internal structure. We see this type of support in things like high-rise buildings and human skeletons. Here, compression is countered by the strength of the steel (or bone) and a great deal of mass.

In an egg there is no internal structure, just a bunch of slimy liquid. The shape of the external shell pushes or transfers the compressive forces to another area. When a chicken sits on an egg, or when you stack books on it, the extra weight generates a greater force of compression on the top of the shell. Because the shell is round, this force is then spread evenly in all directions to the rest of the shell. As the individual shell sections

get compressed, they each take up some of the stress so no one point on the shell gets overloaded. For this type of adjustment to take place in the shell, the extra weight must be added in a slow, steady fashion. If you were to simply drop two or three books on the eggs, they would immediately shatter because the compression is applied too quickly. Time is a critical element in allowing the egg to adjust to the stress. That's why when you drop an egg, it usually breaks no matter what angle it lands at.

Where does this happen in real life?

Romans made extensive use of "eggshell architecture", using the principle in building domes, arches, and bridges. The use of this design eliminated the need for columns to support a roof. Instead, the roof rested solely on the outer walls of the building with the weight distributed evenly throughout the roof.

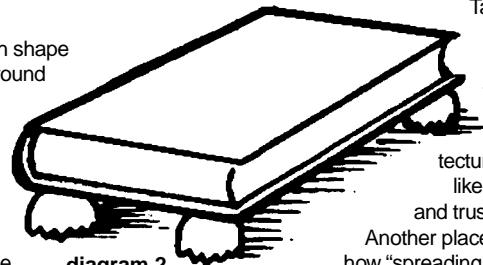


diagram 2

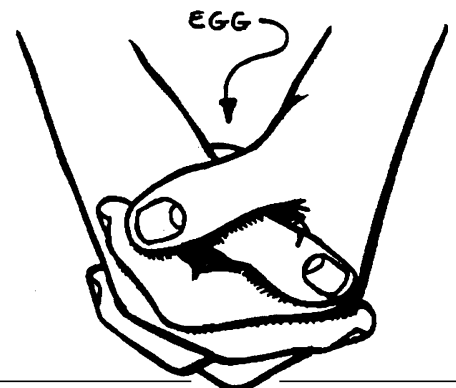
Take a look at different buildings in your community and see how many of them employ eggshell architecture. Look for things like domes, arches and trusses.

Another place that you can see how "spreading the weight" helps to eliminate problems is in a magician's bed of nails. If a person weighing 200 pounds were to step barefoot on a nail, ouch! But by spreading the 200 pounds over 400 nails, any one nail will be getting less than 1 pound of compression which is not even enough to dent the skin.

Now try this

A really fun experiment to test the compressive strength of eggs involves trying to break a raw egg in your bare hands. Have a friend place a raw egg between the palms of your hands. Lock your fingers together and then try to smash the egg. Make sure that you push directly in on the top and bottom and not on the sides. If you do, the egg will break immediately. If you get the compression just right, you'll find that it is impossible to break the egg! Just in case you're a little nervous about getting egg all over the place, it's a good idea to try this over a sink.

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This month in history

March

1862 — Confederate forces are defeated in the Battle of Glorieta Pass east of Santa Fe

1941 — A group led by Glenn Seaborg demonstrates that plutonium is fissionable

1943 — J. Robert Oppenheimer arrives in Santa Fe with select staff to begin setting up for work at the new Laboratory

1945 — The K-25 gaseous diffusion plant at Oak Ridge begins production of enriched uranium-235

1947 — The New Mexico Legislature passes a bill giving Los Alamos residents the right to vote in state elections

1947 — The first proposal is made to employ Monte Carlo computational techniques to solve complex problems

1951 — Julius and Ethel Rosenberg are sentenced to death for their convictions of passing atomic secrets to the Soviets

1954 — The first thermonuclear bomb containing solid fusion fuel is tested in the Bravo shot in the Pacific

1967 — The last of the Western Area homes in Los Alamos are sold to private individuals

1979 — Voyager I reaches Jupiter

1983 — President Reagan calls on U.S. scientists to develop technical alternatives to the arms race, leading to the Strategic Defense Initiative

1995 — A paper is submitted to Physical Review Letters by Lab researchers who may have found indirect evidence that neutrinos have mass

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Crossword puzzle

ACROSS

- 1 Dexterity, nimbleness
- 7 Computational technique developed at Lab (followed by 23 down)
- 12 Madness; folly
- 13 Computer built at Lab under direction of N. Metropolis
- 14 Measure of volume (alt. sp.)
- 15 Computer built by Lab and IBM in 1961
- 16 Mister ___
- 17 All right
- 18 Quasi-military Nazi organization
- 19 Pub
- 21 First large-scale electronic computer
- 24 Pretend not to see
- 26 Gathered
- 31 Overseer of a manor; steward
- 32 Disorderly
- 33 Separate; server
- 35 State to be true
- 36 Type of dance
- 38 Lab division
- 40 Lab program
- 42 That is (L., abbrev.)
- 43 Army rank (abbrev.)
- 44 Type of computer that operates with numbers expressed directly

- 48 High-speed network developed at Lab (acronym)
- 51 Type of computer that operates with number represented by measurable quantities
- 52 Degrade; humble
- 53 Insanely; wildly
- 54 National genetic sequence database set up at Lab
- 19 Feathered flyer
- 20 US author
- 21 Build
- 22 Before noon
- 23 See 7 across
- 25 Eggs (L.)
- 27 Sun
- 28 Climbing annual plant (2 words)
- 29 Rim
- 30 Tints; hues
- 34 Skeptical exclamation
- 35 A long time
- 37 Nothing
- 39 Type of chees
- 40 Euphemistic oath
- 41 Machine for grinding
- 43 Molecular biology database at Lab (acronym)
- 45 Woman's name
- 46 Plaything
- 47 Tom Udall's job (abbrev.)
- 48 Egg-layer
- 49 Peter ___
- 50 Writing fluid
- 52 Paseo ___ Peralta

DOWN

- 1 Total; entire
- 2 Graphic user interface
- 3 Global system of electronic networks
- 4 Hog fat
- 5 Frozen water
- 6 ___ Cobb
- 7 Spoil
- 8 Units
- 9 Young lice
- 10 Terminal access control (acronym)
- 11 Imitative repetition
- 13 Metric ton (abbrev.)
- 15 Winter sport
- 17 Unit

February solution

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spotlight

You gotta love it

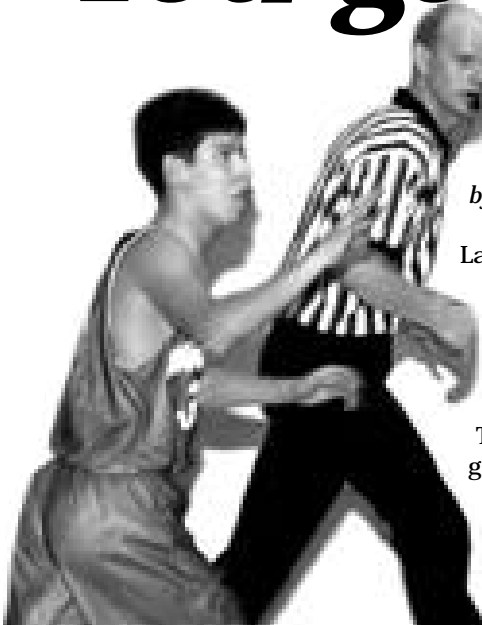


Photo by James E. Rickman; illustrations by Edwin Vigil

by John R. Gustafson

Last fall I was at an 8th-grade basketball game, wearing a black-and-white striped shirt and carrying a whistle. Toward the end of the game a voice from the stands called out, "Ref, you stink!" only not so politely phrased. I probably did stink. It was my first game as a referee, I was

hesitant to blow the whistle and uncertain where to position myself. And the fan prompted me to ask: Why am I doing this?

Many Lab employees — perhaps 100 all told — who spend their spare time officiating basketball, football, soccer and other sports for schools and recreational leagues can answer the question.

Phil Romero, a mechanical technician in Materials Management (BUS-4) and leader of the Española basketball officials, says, "I just love the sport." He must. He was in a gym for 18 days straight in January, calling recreational games and school contests.

Romero got started when he organized a city basketball league and needed refs for the game. "I got the hang of it quickly and I liked it," he says. Twenty-one years later he's still at it.

For Kerry Coffelt, a property administrator in Business Support Services (BUS-8) who has been calling varsity sports since 1981, officiating continues a near-lifelong association with sports. "I lived for baseball when I was a kid," Coffelt says, and as a player and ref "there hasn't been a summer that I haven't been involved with a ball game."

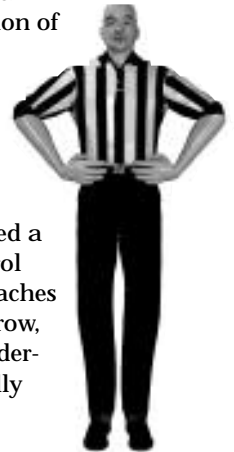
Being a ref is "a chance to give something back to the game," says Matt Hardy, operations shift supervisor in Accelerator Operations and Technical Support (AOT-6), eight-year basketball ref and Los Alamos association leader. "When I was growing up, it was nice to have people involved who cared about the game as much as I did."

"There's no way you're going to call a perfect game," says Danny Lujan, a materials technician in Actinide Process

Chemistry (NMT-2), "but you want to work hard, be in position on every play and know you've given the kids all you could."

Lujan, a 20-year ref and head of the Santa Fe football and baseball officials, values his role as an educator. "High school sports are an extension of the classroom," he says. "We are educators working to promote sportsmanship."

Kim Thomas, Physics Division chief of staff, says promoting sportsmanship extends to coaches and fans, too. Thomas, the only woman selected last year to ref the state high school soccer tournament, initiated a local program of "field marshalls" who patrol the sidelines and try to educate fans and coaches on the rules. "Our hope is that as the kids grow, they and their parents will have a better understanding of the game," and not be so verbally abusive to refs and opposing players, says Thomas, an eight-year veteran.

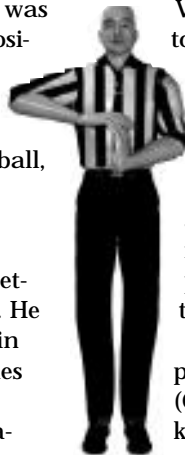


Verbal — sometimes physical — abuse, travel to distant games and using up a lot of vacation time and goodwill with the boss are some of the negatives of being a ref. But other aspects of the work turn it into an overall positive — otherwise why would people do this?

Romero takes pride in providing opportunities for refs to advance, the final reward being selected for state tournaments. And, as Coffelt says, when refs let the game proceed fairly and safely so the players alone determine the outcome, they know they've called a good game.

"Without officials, kids wouldn't get the opportunity to play," says Gary Rich, Business Information Systems (CIC-13) group leader and basketball and football ref. "The kids deserve a good official and a fair game. Even after 18 years, I still love it. I still get butterflies everytime I walk onto the court."

After most of a season I'm a better ref, hopefully enough improved that the loud-mouthed fan would notice a difference. As to why I'm doing this, I share the sentiments offered above by the other refs. If I stick with ref'ing, I hope in time to share their commitment and determination, too.



Technical foul



Pushing

Reflections

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