Reflections

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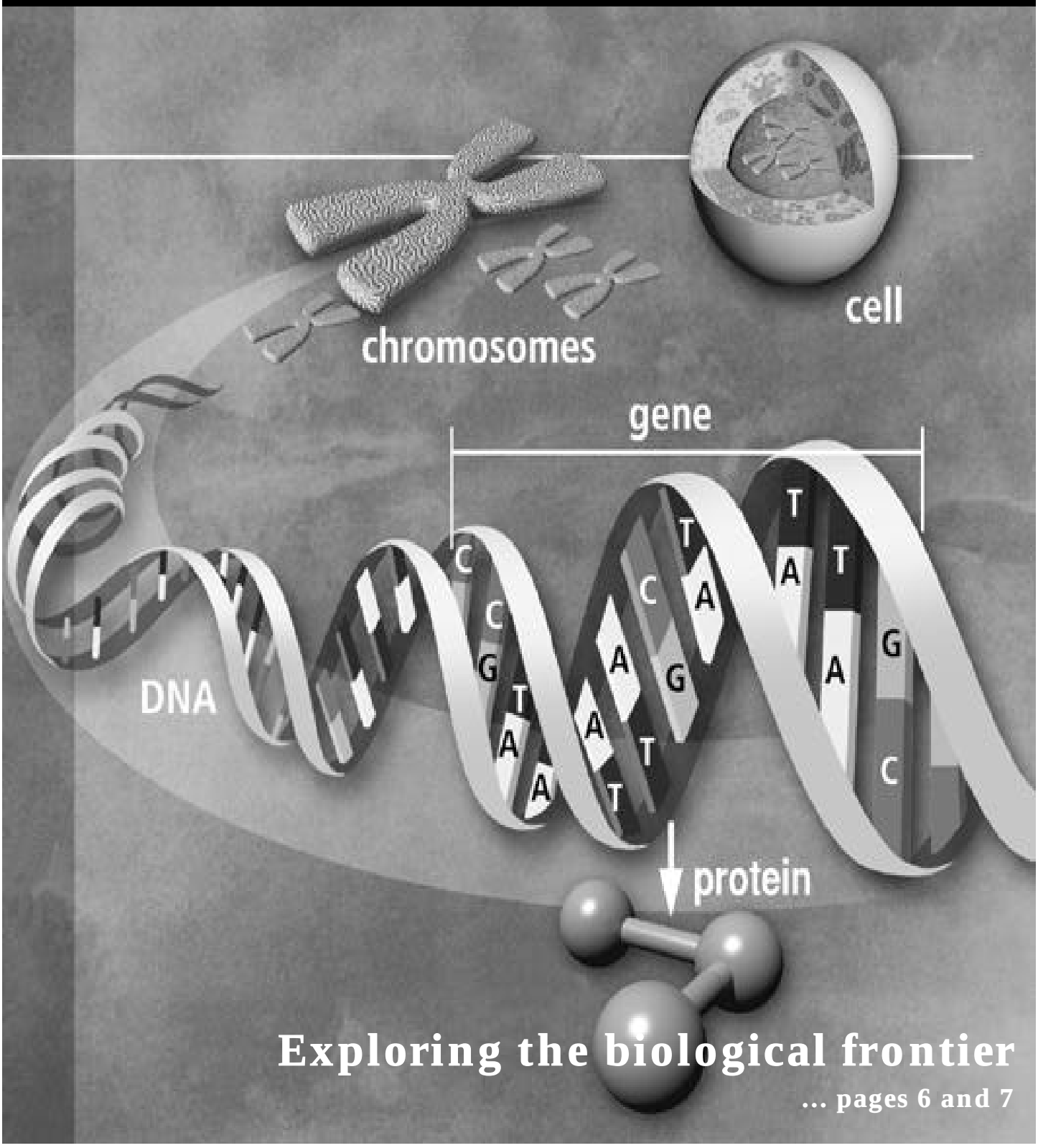

Exploring the biological frontier

... pages 6 and 7

A Department of Energy/University of California Laboratory

Inside this issue ...

Cover graphic courtesy of the DOE Human Genome Program, http://www.ornl.gov/hgmis on the Internet

Reflections

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editor's journal

New century, new innovations in health

On Jan. 27, President Bill Clinton gave his final State of the Union address to the nation. It was the president's longest State of the Union and touched on a wide variety of topics, one of which I found especially intriguing. He noted that in the new century, innovations in science and technology will be key, "not only to the health of the environment but to miraculous improvements in the quality of our lives and advances in the economy." And he pointed out that soon "researchers will complete the first draft of the entire human genome, the very blueprint of life."

I found this to be exciting news, and it made me think about some of the sci-fi shows I've seen over the years. You know the ones that have super healthy, super smart humans striding around looking totally buffed; free from the many maladies we mortals face today. Some of these individuals were equipped with bionic or other high tech body parts; others were programmed for "perfection" in a tube or dish. And while I don't think we're close to creating a super breed of humans who are free of physical flaws and immune to disease, I do believe that in the not too distant future, scientific innovations will greatly improve our health and increase our longevity.

And there is little doubt that genome research will be a major contributor to these innovations. The feature story in this month's "Reflections" takes a look at the Human Genome Project and the role Los Alamos has played in the project (see pages 6 and 7). As President Clinton noted in his address, "It is important for all our fellow Americans to recognize that federal tax dollars have funded much of this research, and that this and other wise investments in science are leading to a revolution in our ability to detect, treat and prevent disease."

Also featured in this month's issue of "Reflections" are a profile of Tom Meyer, the Lab's new associate Laboratory director for strategic and supporting research, and an article on the Lab's Employee Scholarship Fund (see pages 3 and 4). Through the generosity of Lab employees, students from Northern New Mexico are seeing their dream of going to college become a reality. Last year more than $90,000 was raised through employee donations and matched with funds from the Los Alamos National Laboratory Foundation to provide 37 college scholarships to New Mexico students.

And speaking of generosity, Kathy DeLucas has graciously agreed to share her thoughts with you in this space beginning next month. She will serve as editor of "Reflections" and the Daily Newsbulletin while I do a stint as acting deputy director for Public Affairs. Writing a monthly column that I hope interests our readers is not as easy as I originally thought, and I want to thank those employees and retirees who have responded to and supported my efforts during the past three years.

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'Tar Heel' takes helm of SSR

by Kevin N. Roark

Even though he's had a distinguished academic career, Tom Meyer, the new associate Laboratory director for strategic and supporting research, has no plans to rest on his laurels. "I'll admit, I'm bullish on the Laboratory," said Meyer. "But if I weren't, I wouldn't be here. There is a prominent place in the scientific hierarchy of America for our Laboratory, and I plan to work hard to make sure that Los Alamos maintains its reputation for doing the best science in the world with the best people in the world."

A member of the National Academy of Sciences and the American Academy of Arts and Sciences, Meyer was an award-winning distinguished professor of chemistry at the University of North Carolina at Chapel Hill. He also served as vice provost for graduate studies and research at UNC until his appointment as associate director at Los Alamos in December 1999. Meyer received his doctorate in chemistry from Stanford University in 1966. With a research focus on the photochemical, catalytic and reactivity properties of metal complexes and their application in artificial photosynthesis, Meyer has published nearly 500 scholarly papers and has two patents.

Tom Meyer, associate Laboratory director for strategic and supporting research

After almost 32 years in North Carolina, Meyer says the transition to life in Northern New Mexico has been free of any major shocks or surprises because of a long-standing love for the area. "Many years ago, I spent a couple of months at Sandia as a visiting scientist, and ever since then I have managed to get out this way every year or so. My wife and I are both very fond of New Mexico." Meyer's transition to work at Los Alamos has been smooth as well. "As vice provost I dealt daily with people and projects on subjects ranging from physics to poetry. While the scale at Los Alamos is certainly more grand, the management issues at this level remain largely the same, dealing with people, getting to know the details of projects and programs, and learning as I go. One of the great pleasures of this job will be the opportunity to broaden my scientific understanding."

The father of two grown sons, Justin, a musician in Boston, and Tyler, a traffic planner for the city of Greensboro, N.C., Meyer and his wife Sandra have settled in the northside area of central Santa Fe. "When we decided to look for a house in Santa Fe we wanted only two things, a view and a wine cellar," said Meyer. "Of course the house we found has neither, but living close to downtown we can walk to the plaza, and it is quintessential Santa Fe."

Just as when the Meyers lived in Chapel Hill, they plan to become involved in the community. Enjoying the traditional gallery openings on Friday evenings, attending the chamber music festival events and the Santa Fe Opera are sure to become their pastimes. "As the season turns to springtime, we plan to take full advantage of the beautiful trails in and around Los Alamos and White Rock and do some jogging and hiking," said Meyer.

For now, the new associate Laboratory director continues to get acquainted with the people in the divisions under the Strategic and Supporting Research Directorate and to tackle the major goals he has set for SSR. Meyer says the restoration of full Laboratory Directed Research and Development funding is high on his list, as well as the breaking down of internal barriers in order to create an environment that promotes research at all levels of the Laboratory.

Investing in New Mexico students

"There is a loftier ambition than merely to stand high in the world. It is to stoop down and lift mankind a little higher."
—Henry Van Dyke

by Steve Sandoval

A Las Vegas, N.M., small-town boy with plenty of hopes and dreams but little money to pay for them is attending Harvard University, thanks to the Laboratory.

Mesa Vista High School graduate Christine Bustos is attending New Mexico State University this year. She hopes to later attend Columbia University and one day wants to become a surgeon.

Sounds like made-for-television movies, but they aren't. They're real-life events happening because of the generosity of Laboratory employees and subcontract personnel who have contributed to the fledgling Los Alamos Employees' Scholarship Fund.

The fund drive kicks off its third year later this month, and in May, several Northern New Mexico high school seniors will receive scholarships through the fund.

Luke Winston, a Las Vegas Robertson High School graduate, began attending Harvard last fall where he is studying applied sciences.

Other scholarship recipients are attending a range of universities from Brown and University of California, San Diego to Notre Dame and Rice.

Last year, the $91,000 raised through the program was coupled with a $23,000 matching contribution from the Los Alamos National Laboratory Foundation to award scholarships to 37 New Mexico high school seniors and undergraduates.

"This program has worked for two reasons," said Chris Olivera of the Laboratory's Community Relations Office (CRO). "Laboratory employees have donated to the fund. But perhaps more importantly, employees have volunteered their time to visit schools and meet with students, teachers and families to talk about the program.

"By 'marketing' the scholarship program students not only learn about another possible opportunity to help pay for their college education, they also learn about the Laboratory and what we have to offer," said Olivera. "And students also see Lab scientists and nonscientists equally committed to helping students. It really works for both the student and the Lab."

Norman Hamer of Systems Engineering and Integration (TSA-3) is one of about 25 Laboratory employees who spend several hours a week in area schools to talk about the fund. "When we talk to the students at the high schools they are amazed that the employees are taking money out of their paychecks to help them go to college and get a good education," he said.

"I believe the scholarship program to date is one of best things the employees at the Lab have done for the Northern New Mexico community," Hamer continued. "It shows that members of the Lab are interested in education in this area and are doing something about it."

Likewise, Melissa Robinson of Business Planning and Analysis (BUS-3) said, "I think this employee scholarship program is one of the best things that has happened for Northern New Mexico students."

Robinson became a volunteer for the Los Alamos Employees' Scholarship Fund while completing coursework for a master's degree in 1998. She had to participate in a community service project or activity and heard of the program. She contacted Bob Romero of Materials Science Processing (NMT-11), who with Gene Farnum of Structure/Property Relations (MST-8) helped establish the program with the Laboratory Foundation.

Robinson, Hamer and other volunteers now are the biggest cheerleaders for the scholarship fund. "It is nice to be able to go out to schools and meet these students and realize what strong capabilities they have," Robinson said. "It also has been a real eye-opener to me as to the caliber of students we have in the area. They manage to take difficult academic subjects and do well but still have time to be involved in community and school activities."

Added Hamer, "We see so much negative news about students, it is refreshing to see that there really are smart, hardworking, diligent students in this world. You can put your money in the stock market, but a better investment might just be to put it into the education of these really excellent students that are applying for scholarships from our fund.

"When the money is handed out in April, it is just like having Christmas a second time in the year."

Volunteers make the scholarship program work

The following are volunteers on the Los Alamos Employees' Scholarship Fund Advisory Board:

- Audits and Assessments (AA) Division: James Loud
- Business Operations (BUS) Division: Gloria Garcia, Dave Redman, Melissa Robinson, Amy Sahota, Mary Van Eeckhout, Barbara Vigil
- Computing, Information and Communications (CIC) Division: Rueben Roybal
- Community Relations Office (CRO): Barbara Grimes, Chris Olivera
- Environmental Science and Waste Technology (E): Patricia Leonard
- Environment, Safety and Health Division (ESH): Julie Johnston
- Government Relations Office (GRO): Stella Taylor.
- Human Resources (HR) Division: Marti Browne, Heidi Hahn, Sandy Misage, Carol Trask
- Materials Science and Technology (MST) Division: Gene Farnum, Frederick Mueller
- Nonproliferation and International Security (NIS) Division: Evelyn Mullen
- Nuclear Materials Technology (NMT) Division: Robert Romero
- Science and Technology Base (STB) Programs: Pam Bivens, Camilla Lopez.
- Technology and Safety Assessment (TSA) Division: Norman Hamer.
- Los Alamos National Laboratory Foundation: Susan Herrera

Birds of a feather do more than flock together

A molting Mexican spotted owl.

by Kay Roybal

A pair of Mexican spotted owls nesting in the Jemez Mountains has inspired a molecular ecology project that may help preserve other threatened and endangered species.

With technology developed through the Lab's Center for Human Genome Studies, researchers are studying the genetic characteristics of the owls by collecting and analyzing their feathers. Their work could provide valuable information about the birds to wildlife researchers interested in stabilizing endangered species populations.

Jon Longmire and Mary Maltbie, both of Genomics (B-3), and Leslie Hansen and Terrell Johnson of Ecology (ESH-20) are comparing their discoveries about the Jemez owl population with information gleaned from the feathers of birds in other nearby mountain ranges. Eventually, they hope to draw conclusions about the species' range and the genetic ties between different populations.

Longmire and Maltbie, who have built a reputation for molecular biology studies on various species of birds, including peregrine falcons and whooping cranes, proposed the Laboratory-Directed Research and Development project because it "might have a positive impact on a species of local importance," Longmire said.

LDRD funding allows the Lab to invest in innovative research to extend its science and technology capabilities. The spotted owl project addresses the Laboratory's civilian national mission, while expanding its core technical competency in bioscience and biotechnology.

The Mexican spotted owl (*Strix occidentalis lucida*) was listed as federally threatened in 1993. This subspecies of the spotted owl is found in northern Arizona, southeastern Utah and southwestern Colorado south through New Mexico, west Texas and into Mexico. It generally inhabits mixed conifer, pine-oak and riparian habitat in mountains and canyons.

The U.S. Fish and Wildlife Service's recovery plan for the subspecies requires research on population biology, gene flow and genetic isolation of populations. In the past, researchers had to capture and handle the birds to take blood or tissue samples. Collecting feathers that have fallen in and around nests lessens the chance of hurting the owls or influencing their behavior.

Johnson has collected nearly 600 Mexican spotted owl feathers from 16 identified territories in the Jemez Mountains over the past 17 years. Hansen has built a database of feathers after photographing each one, giving it a number for tracking purposes and placing it in a bag to prevent cross contamination.

In the lab, Maltbie dices the end of a feather and places it in a solution that will rupture the cells and release the DNA. After eliminating proteins and other contaminants, she is left with a relatively pure form of DNA.

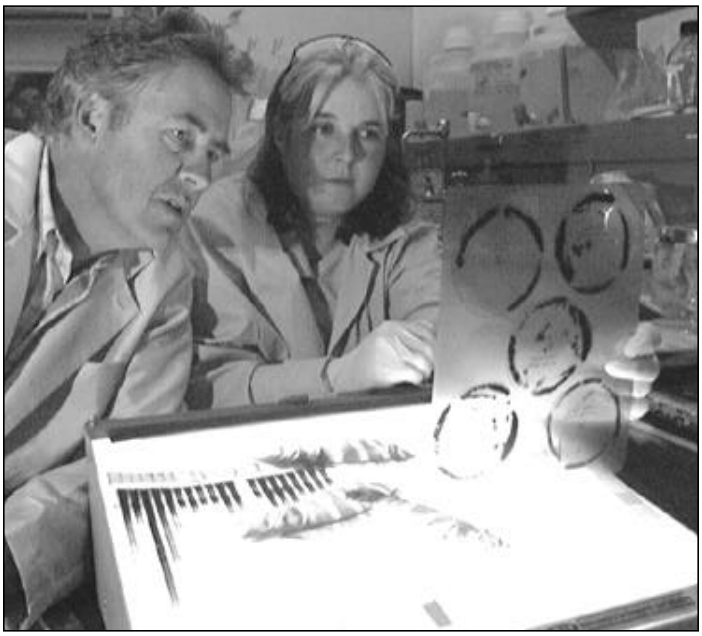
"We examine the sample for a specific set of repeats, usually one to six base pairs repeated over and over," she said. Maltbie compares the repeats from the DNA of the Jemez owls with those from a DNA sample of a Mexican spotted owl housed in a rehabilitation center in Albuquerque.

The data produced by this project will allow the researchers to gain a better understanding of several aspects of spotted owl biology.

"We don't yet know how far these birds travel, how long they live, how successful they are at reproducing or whether they are site-specific," Longmire said. "When our database is complete, we will be able to identify every individual bird within the population and begin to answer some of these questions."

A comparison of DNA from different populations will be useful in making management decisions should the numbers of one group begin to decline.

"We would want to know which of the available healthy populations are genetically similar to one that's crashing, so wildlife managers can make informed decisions on restocking," Longmire said. "We may also find out that there's not enough genetic variation present within a population for it to be healthy, and managers may want to introduce birds that will add genetic diversity."



Jon Longmire and Mary Maltbie, both of Genetics (B-3), examine an X-ray film from an experiment to identify clones within the library of spotted owl DNA that contain the sequences they're searching for. *Photo by LeRoy N. Sanchez*

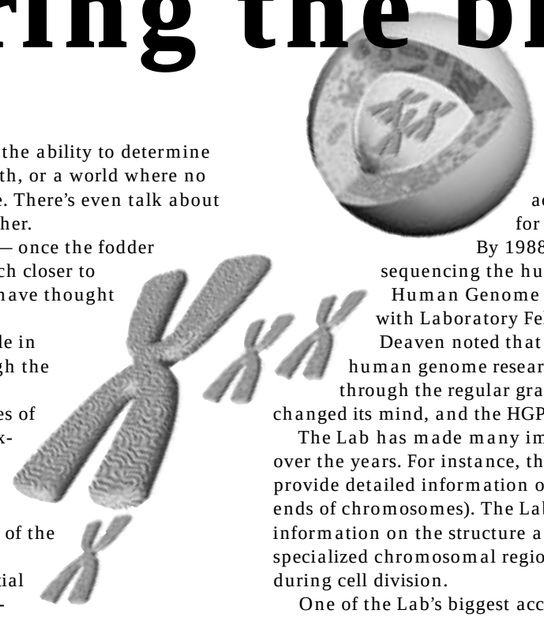
Reflections

Exploring the biological frontier

by Ternel N. Martinez

It's hard to imagine someone having the ability to determine a baby's personal appearance before birth, or a world where no one ever grows old or contracts a disease. There's even talk about one day creating a new life form altogether.

Yet, these and many other scenarios — once the fodder for science fiction novels — now are much closer to becoming a reality than anyone might have thought possible just a few years ago.



The Laboratory is playing a major role in pushing these biological frontiers through the U.S. Human Genome Project, a joint Department of Energy/National Institutes of Health effort to identify all of the approximately 140,000 genes in human DNA and determine the sequences (order) of the 3 billion chemical base pairs that make up the human genome. The order of the base pairs underlies all of life's diversity.

Rarely has one project held such potential for applications both wondrous and frightening at the same time. Knowledge about the effects of DNA variations among individuals may help researchers better diagnose, treat and possibly even eradicate the more than 4,000 genetically inherited human disorders, possibly even before birth. The project also raises profound ethical questions.

The HGP actually is a misnomer because the genomes of other species currently are being sequenced as well, including those of the fruit fly, earthworm, mouse and certain bacteria and plants. Information derived from nonhuman genomes often helps researchers better understand human biology, and may be used to solve problems in health care, energy sources, agriculture and environmental cleanup.

Last year alone, many institutions reported significant achievements in genome research. For example, a consortium of U.S. and European scientists reported completely sequencing chromosomes 2 and 4 of the plant Arabidopsis, providing new information about chromosome structure, evolution, intracellular signaling and disease resistance in plants. DOE funded the work in part.

Another international team of researchers reported having completely sequenced human chromosome 22, a first for human genome research. The researchers identified hundreds of previously unknown genes in the process.

Deciphering the genome requires close collaboration and cooperation across several disciplines: biology, engineering, chemistry, mathematics and physics. With expertise in each, Los Alamos already had made significant progress in genetics several years prior to the birth of the HGP and helped develop the framework for the project.

In 1982 the Lab established GenBank, a database that serves as a national repository for genetic sequence information. The NIH now maintains the database. In 1983, Los Alamos and Lawrence Livermore national laboratories created DNA libraries from flow-sorted human chromosomes, said Larry Deaven, acting director for the Lab's Center for Human Genome Studies.

By 1988, funding was made available for sequencing the human genome. The Lab's Center for Human Genome Studies also was created that year, with Laboratory Fellow George Bell as its first leader.

Deaven noted that at first the NIH believed that human genome research would best be accomplished through the regular grant-awarding process. The NIH later changed its mind, and the HGP became a formal project in 1990.

The Lab has made many important contributions to the HGP over the years. For instance, the Lab was the first institution to provide detailed information on the structure of telomeres (the ends of chromosomes). The Lab also provided insight and new information on the structure and function of centromeres, specialized chromosomal regions that play important roles during cell division.

One of the Lab's biggest accomplishments in genome research occurred in 1995, when it produced the first high-resolution physical map of chromosome 16, which contains several hundred "disease genes" that cause, predispose or protect from diseases. These include genes associated with leukemia, breast and prostate cancer, Batten disease, hemoglobin disorders and a type of kidney disease. The map detailed the order of the DNA fragments along the chromosome.

"We chose to work with chromosome 16 because it was a medium-sized chromosome, not too big, not too little," Deaven recalled. "We wanted to try a new mapping process on a chromosome that was more difficult than the smallest human chromosomes, but not as complex as the largest ones." Chromosomes vary in length from about 50 million to about 260 million base pairs. Chromosome 16 contains about 100 million base pairs.

"We also had done a fair amount of biological work on certain regions of this chromosome in the past, so it made sense to continue focusing on that one."

In 1996, Los Alamos joined forces with other DOE national laboratories to form the Joint Genome Institute, combining the genome centers of each into one virtual organization. Los Alamos has the lead role in sequencing data quality control for the institute.

Last November, the JGI joined the other large sequencing centers in the world in celebrating the milestone of having sequenced one-third of the human genome's base pairs. "We achieved this milestone much faster than anyone initially anticipated," said Deaven. All new sequencing data is posted on a publicly available World Wide Web site daily.

The JGI is part of a consortium of five genome institutes working together to sequence the entire genome. The other participants are the Sanger Centre in Britain, the Washington University Genome Sequencing Center in St. Louis, the Whitehead Institute in Cambridge, Mass., and the Baylor College of Medicine. The consortium commonly is referred to as the G5.

The JGI is responsible for sequencing chromosomes 5, 16 and 19. Chromosome 5 contains 60 known disease genes, including those for asthma, muscular dystrophy, Leigh syndrome and colorectal cancer. Chromosome 19 has 63 known disease genes, including those for atherosclerosis, cystic fibrosis, Alzheimer's disease and retinitis pigmentosa. By the end of last year, 54, 31 and 86 percent of chromosomes 5, 16 and 19 had been sequenced, respectively.

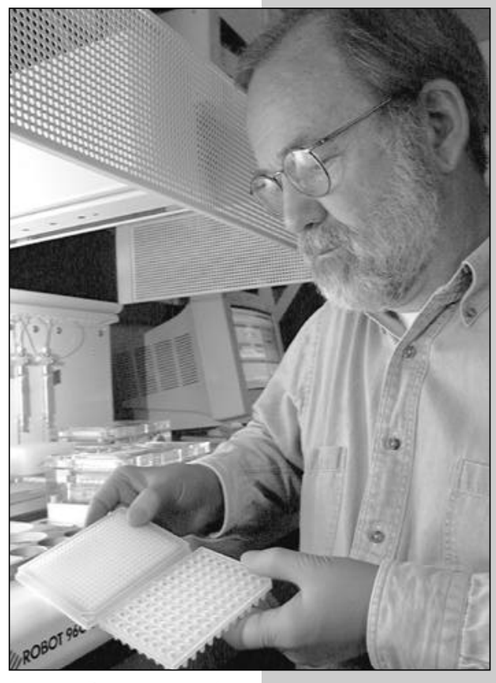
The completion date for sequencing the human genome originally was 2005. The new date now is 2003, though that also is highly fluid, a reflection of the increased interactions among the G5 members, ever improving sequencing technology — and fierce competition among public and private institutions to be the first to decipher the genome's secrets.

"Today it costs the JGI about $2 to sequence one sample, yielding approximately 500 base pairs of data, and our goal is to reduce that cost further to about $1 per sample," Deaven said. "As sequencing becomes less expensive, money that might have been spent for this task may instead be used for functional or structural genomics, in which we have expertise as well."

Functional genomics is the study of the function of genes and their interactions with each other; structural genomics is the study of the physical organization of the proteins encoded by families of genes and the relationships between structure and function of those proteins.

Several moral and ethical issues regarding HGP also must be addressed. These include intellectual property and patent rights and their impact on scientific collaboration; privacy, confidentiality and consent of patients; and ownership and control of genetic information.

Researchers, ethicists and many others are studying these issues. "Can genes be patented, and if so, under what circumstances? How will patients' rights be protected? These and many, many other questions need to be answered while we're sequencing genomes and obtaining invaluable information, not after," said Deaven.



Larry Deaven, acting director for the Center for Human Genome Studies, holds two different plate wells that hold the DNA fragments for sequencing. The plate well in his left hand contains 96 wells; the other contains 384 wells. A typical sequencing machine can hold four plate wells at once. *Photo by Leroy N. Sanchez*

Speaking HGP-ese

Below is a glossary of some terms commonly used in the Human Genome Project. A more detailed glossary is available on the World Wide Web at *http://www.ornl.gov/hgmis/publicat/glossary.html*

Base pair: Two nitrogenous bases (adenine and thymine or guanine and cytosine) held together by weak bonds. The bonds hold two strands of DNA in the shape of a double helix.

Base sequence: The order of nucleotide bases in a DNA molecule.

Base sequence analysis: A method, sometimes automated, for determining the base sequence.

Chromosome: The rod-like structure found in the cell's nucleus that contains the genes. Chromosomes are composed of DNA and proteins.

Cloning: Using specialized technology to produce multiple, exact copies of a single gene or other segment of DNA to obtain enough material for further study. The resulting cloned collections of DNA are called clone libraries.

DNA (deoxyribonucleic acid): The molecule that encodes genetic information. DNA is a double-stranded molecule held together by weak bonds between base pairs of nucleotides. In nature, base pairs form only between adenine and thymine and between guanine and cytosine.

DNA sequence: The relative order of base pairs, whether in a fragment of DNA, a gene, a chromosome, or an entire genome.

Gene: The fundamental physical and functional unit of heredity. A gene is an ordered sequence that encodes a specific functional product.

Gene mapping: Determination of the relative positions of genes on a DNA molecule and of the distance, in linkage units or physical units, between them.

Genome: All the genetic material in the chromosomes of a particular organism; its size is generally given as its total number of base pairs.

Genomics: The study of genomes, which includes genome mapping and sequencing and gene function.

Protein: A large molecule composed of one or more chains of amino acids in a specific order that is determined by the base sequence of nucleotides in the gene coding for the protein. Each protein has unique functions and is required for the structure, function and regulation of the body's cells, tissues and organs.

Sequencing: Determination of the order of nucleotides (base sequences) in a DNA or RNA molecule or the order of amino acids in a protein.

Ramsey selected deputy division director of FWO


Beverly Ramsey

Beverly Ramsey has been selected deputy director of the Facilities and Waste Operations (FWO) Division. She recently joined the Lab from Advanced Technologies & Laboratories International Inc., where she was western operation manager and vice president.

Ramsey began her career as a research scientist in the Environmental Sciences Division at Oak Ridge National Laboratory in 1969. She has held a variety of nuclear and environmental technology positions with major industry and is the author of numerous papers. She earned a bachelor's degree from Carson-Newman College in Jefferson City, Tenn., and master's and doctoral degrees in ecosystems analysis from the University of Tennessee.

"Beverly will bring a wealth of management and leadership experience to FWO," said FWO Division Director Tony Stanford. "She has extensive technical experience in the areas of nuclear engineering, transportation, design engineering and construction, and environmental engineering."

FWO focuses on eight core capabilities: facilities maintenance, nuclear facilities management, institutional facilities management, engineering support, utilities services, fire protection services, facility deconstruction and dismantlement activities, and waste management operations — including sanitary, hazardous and radioactive waste.

Luce appointed NMSEA chairman


Benjamin Luce

Benjamin Luce of Mathematical Modeling and Analysis (T-7) is the new chairman of the New Mexico Solar Energy Association.

Luce is a theoretical research physicist whose work deals primarily with nonlinear phenomena in optics and the theory of partial differential equations.

The New Mexico Solar Energy Association, headquartered in Santa Fe, is a not-for-profit educational group created in 1972. Its goal is to further solar and related arts, sciences and technologies with concern for the ecological, social and economic fabric of the region. Luce will serve a two-year term as chairman.

The association is a chapter of the American Solar Energy Association and currently has 207 members made up of solar professionals, scientists, architects and other professionals interested in promoting solar energy.

One of the organization's 23 projects and/or publications is the SunChaser2, a mobile education unit that tours the state providing information and increasing awareness of the benefits and practicality of solar energy. SunChaser2 is partially funded by a grant from the Los Alamos National Laboratory Foundation.

Luce has worked at the Laboratory six years, including three years as a post doctoral candidate in the Center for Nonlinear Studies in the Theoretical (T) Division.

Luce has a bachelor of science degree in physics from State University of New York at Fredonia and master's and doctoral degrees in physics from Clarkson University in Potsdam, N.Y.

More information about the New Mexico Solar Energy Association can be found at *http://www.nmsea.org* on the World Wide Web.

Armijo named CRO director


Christina Armijo

Christina Armijo is the new director of the Lab's Community Relations Office (CRO). Armijo joined the Laboratory in 1990 and has worked as a manager in several versions of the Lab's community outreach organizations.

She headed the University of California's Northern New Mexico office before her new appointment.

CRO has lead responsibility for overseeing and strengthening the Lab's relations and interactions with Northern New Mexico communities and pueblos. "This is a critical time for the Lab to demonstrate it can be a more effective partner with the citizens of Northern New Mexico," Armijo said. "I am excited to have the opportunity to contribute significantly to that effort."

Before joining the Lab, Armijo spent 14 years with the Department of Energy in various positions. From 1987

continued on Page 9

In Memoriam

Leroy Schmidt

Laboratory retiree Leroy C. Schmidt died Aug. 5, 1999. He was 77. Schmidt was born in St Louis, Mo., where he graduated from Hadley High School. At the age of 24, Schmidt enlisted in the Navy. In 1951 he attended Washington University as a drafting engineer for a year. He came to work for the Lab in 1951 as an industrial tool maker for the former Statistics (SD-1). In 1967 he worked with the former Low Temperature and Cryogenics group (CMF-9). In 1982 he worked with the former Branch Shops (MEC-5). Schmidt worked 31 years for the Lab until his retirement in 1982.

Charlene Douglass

Lab employee Charlene Douglass of the Security and Safeguards (S) Division passed away Jan. 1 after a courageous battle with cancer. Douglass joined the Lab in 1967 and worked in the former Computing (C) Division for 12 years, serving as the Lab's computer security site manager and the computer protection program manager. She later joined the former Operational Security/Safeguards (OS) Division, which was a predecessor of S Division. Douglass most recently served as the Compliant Program leader for the Information Security Policy Board. She also was a member of the Department of Energy Computer Security Group and served as chair of that group's Training Conference Committee.

January and February employee service anniversaries

January

35 years
R.A. Briesmeister, NMT-14
Larry Vaughan, ESA-EPE

30 years
Michael Backsen, ESA-EPE
Richard Bagley, ESH-5
Justo Cordova, LANSCE-2
Monica Fink, IBD
Judy Marriott, HR-5
Fabian Martinez, HR-1
Daniel Sandoval, ESH-5
John Steinkamp, B-5
John Wolcott, NIS-NAC

25 years
Margaret Baca, BUS-2
Ronald Christian, FWO-FE
Donald Close, NIS-6
Stephen Czuchlewski, DX-3
Norman Elliot, MST-7
John Farr, NMT-11
Joseph Ginocchio, T-5
Allen Hartford Jr., STB-DSTBP
John Hendricks, X-5
David Kachelmeier, DX-1
Phillip Klingner, NIS-3
Richard Larson, ESA-WE
Fred Roensch, CST-11
Joe Romero, ESA-TSE
R.F. Strickler, BUS-5
S. Dale Soderquist, NMT-5
W. A. Teasdale, P-23
Joe Thompson, MST-10
Carl Wilson, CST-6

20 years
Harold Armstrong, CIC-7
Gerald Bone, BUS-5
Thomas Carey, NIS-2
Allen Cogbill, EES-3
David Cremers, CST-1
Caroline Dingus, CIC-6
Juan Fernandez, P-24
Elizabeth Foltyn, NMT-9
Marcia Gallegos, CIC-14
Charlotte Garcia, ESH-13
Chester Higgins, NMT-8
Edward Idar, X-4
Jack Johnson, ESH-13
Steven Maaranen, ALDTR
Elizabeth Martinez, BUS-8
Raymond Martinez, NMT-11
Timothy Martinez, NMT-1
Cindy Mills, NMT-2
Joyce Moore, MST-7
Claudia Peck, NMT-3
Sarah Pacheco, HR-5
John Power, SNS-PO
Billy Roybal, MST-6
Catherine Salazar, BUS-2
Nancy Scheer, NMT-15
John Viechec, FWO-IFMPO
Marilyn Yeamans, TSA-5

15 years
Patricia Aguilar, BUS-4
Maria Atencio, NIS-RD
Patricia Berger, CRO-2
Joseph Butner, TSA-11
Julie Carpenter, ESH-12
Sean Clancy, X-10
Carol Cox-Devore, ESH-IMPT
Robert Devine, ESH-4
James Estes IV, S-1
Pamela French, P-DO
Judy Fresquez, ESA-WE
John George, P-21
Debbie Gonzalez, IBD
Yvonne Gonzales, BUS-6
George Gray III, MST-8
Thomasina Gurule, BUS-3
Lori Hicks, BUS-1
Hector Hinojosa, CIC-1
Thomas Houlton, ESH-4
Alan Kernodle, LANSCE-7
Ping Lee, ALDNW
Ethel Martinez-Diaz, HR-5
Geraldine Martinez, NIS-4
Sarah-Jane Maynard, BUS-6
Andrew McCown, TSA-4
Fred Mueller, MST-STC
George Newman Jr., ESH-1
Frank Olivas, BUS-1
Hain Oona, ESA-TSE
Wilton Parsons, T-DO
Peter Pazuchanics, P-23
Darrell Peterson, X-1
Michael Plum, LANSCE-2
Keith Rendell, PM-3
Charles Rense, NMT-5
Cary Skidmore, DX-2
James Smith, MST-CMS
Debbie Spore, ESH-3
Desmond Stack, TSA-11
Jacqueline Stack, CIC-14
Cheryl Straub, BUS-8
Harunori Takeda, SNS-PO
Garth Tietjen, CIC-1
Sandra Zink, STB-DSTBP

10 years
John Berg, NMT-11
Bradly Cooke, NIS-4
Bernard Foy, CST-6
Joseph Giles, NIS-DO
Walter Hansen, NIS-5
Cheryl Kuske, B-7
Craig Leasure, NW-MM
Loretta Lopez, HR-7
Rick Martineau, DX-5
Nestor Ovalle, HR-3
Denny Rice, CIC-5
Amy Robinson, CIC-1
Jeanne Robinson, CST-6
C. William Rodriguez, ESA-DE
Chris Rose, LANSCE-12
Robert Swift, NMT-14
Erik Vold, X-3
Jeffrey Whicker, ESH-4

5 years
Mark Abhold, NIS-5
Rick Alexander, FWO-WFM
Leroy Apodaca, DLDBAO
Timothy Babicke, HR-8
Gian Bacigalupa, ESH-19
G. Morrison Bennett, LC-BPL
Janel Bigcrow, CIC-13
Stephen Calia, EES-5
Larry Collins, ISEC
Julian Cummings, CIC-ACL
Kurt Eberl, ESA-DE
Donald Gerheart, ESH-13
Jose Gomez, FWO-WFM
Debora Hall, FWO-RLW
Martin Jones, ESA-MT
Richard Kendall, CIC-DO
Jason Kitten, CST-11
Linda Lewis, CIC-1
Tony Mondragon, S-6
Jim Morgan, CIC-1
Tinitia Oliver, ESH-1
Veronica Pacheco, PA
James Painter, CIC-ACL
Charles Peper, FWO-WFH
Pete Pittman, ESA-EPE
Doris Quintana, NMT-1
David Robbins, DX-1
Mark Robinson, NMT-7
Charity Roybal, ESH-4
Davy Sparks, NMT-2
Ralph Trujillo, BUS-8
Valerie Trujilo, HR-5
Ruth Ann Vargas, MST-11
Annette Vigil, BUS-3
Deborah Wilke, PA
Todd Williams, T-3
Lu Ann Zook, ESH-14

February

35 years
Epifanio Eden, NIS-4

30 years
Pruit Ginsberg, DX-1
Patrick McClellan, LANSCE-2
Sharon Velarde, ESH-12

25 years
Fred Archuleta, P-24
Karen Brewer, ESA-EPE
Maria Fernandez, S-4
Finnie Garcia, ESH-1
John Gomez, P-25
Grant Heiken, EES-1
David Keffeler, LANSCE-5
Caroline Mason, NMT-15
C.T. Mottershead, LANSCE-1
John Pendergrass, TSA-4
Morris Pongratz, NIS-1
Anthony Rose, NIS-1
C.M. Schneider, NIS-5
R. Ralph Trujillo, MST-6
Lawrence Witt, NW-SS

20 years
Carolyn Algire, NW-PMPO
Brodie Anderson, P-22
Mary Barbe, DIR
Gregg Chaparro, LANSCE-3
Thomas Dey, X-7
Gerald Dunlop, NMT-8
W.R. Everett III, ESA-TSE
Michael Garcia, ESA-EA
Mary Hopson, CIC-5
James Lime, TSA-10
Dorothy Martinez, NW-SS
R. Bruce Matthews, STB-DSTBP
Michael Mauro, MST-6
Sylvia Quintana, HR-5
Michael Ragsdale, PM-2
David Redman, BUS-2
Frances Talley, PA
Deborah Thompson, CIC-DO
Paul Weber, NIS-2

15 years
Elaine Best, CIC-12
Tarlochan Bhatia, LANSCE-1
Ronald Brodd, FWO-DF
Courtney Bryan, S-8
Thomas Cote, LANSCE-8
Peter Haase, NIS-5
Elizabeth Kelly, TSA-1
David Lizon, MST-11
Patricia Mahoney, ESH-3
Eric Peterson, MST-STC
Noah Pope, PMDS
Lennett Rendon, HR-5
Sheila Riedel, HR-5
Erlinda Salazar, MST-8
Horace Sprouse, S-SPO
Carolyn Vigil, T-11
Herman Vogt Jr., BUS-3
Karen West, E-PPC
Robyn Zaelke, NMT-10

10 years
Christina Armijo, CRO
Claude Conner, LANSCE-9
Randi Moore, CIC-1
Mohsen Sharirli, ESA-WMM
Lonnie Theye, NMT-9
Neil Zack, NIS-7

5 years
Aaron Archuleta, LANSCE-9
Yvette Beavers, NMT-8
Larry Brown, BUS-8
Gilles Bussod, EES-5
Annie Castaneda, BUS-1
Jane Enter, E-ET
Garry Franklin, CRO-2
Lisa Gardner, CIC-6
Kapil Goyal, NMT-7
Robert Jones, FWO-IFMPO
Mark Kenamond, ESA-EQ
Michael Koscielniak, TSA-5
Rose Ann Maestas, ESA-MT
Joyce Martinez, NMT-13
Jeremy Mitchell, NMT-11
Avril Millensted, FWO-SWO
Frank Olivera, CRO-1
Kelly Reynolds, BUS-8
Jane Riese, CIC-12
Theresa Sandoval, CRO-1
Jeffrey Schroeder, PM-3
Deborah Summa, ESA-MT
Denise Tiede, S-6
Scott Twary, B-2
Annabelle Valdez, CIC-7
Randolph Vaughn, NMT-8
Benjamin Warner, CST-18
Meilin Yan, CIC-3

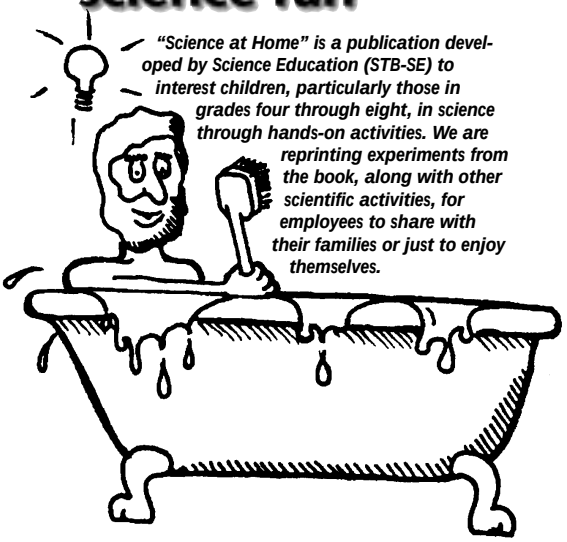
Armijo

continued from Page 8

to 1990 she was an assistant press secretary at DOE Headquarters working for Defense Programs and later for Environmental Restoration and Waste Management.

The Community Relations Office is part of a new division, Laboratory Communications and External Relations. The division also includes the Public Affairs and Government Relations offices.

science fun

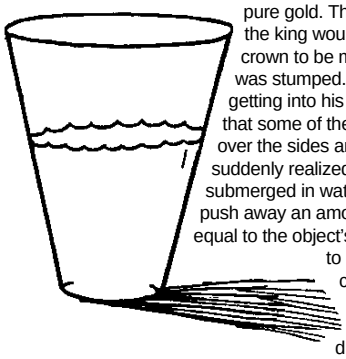


"Science at Home" is a publication developed by Science Education (STB-SE) to interest children, particularly those in grades four through eight, in science through hands-on activities. We are reprinting experiments from the book, along with other scientific activities, for employees to share with their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

Eureka! Measuring density

Which weighs more, a pound of feathers or a pound of lead? Of course this is a trick question because a pound of anything still weighs a pound. But if you held both items in your hands, a pound of lead would seem to weigh more because it takes up a lot less space. The property of matter that compares an object's weight to the amount of space it takes up is called density.

Density was first analyzed over 2,000 years ago by the ancient Greek philosopher, Archimedes. This was the problem that Archimedes set out to solve: A king hired a goldsmith to make a solid gold crown. Because the king didn't trust the goldsmith, Archimedes was asked to make sure the crown was pure gold. The easiest way of doing this was to melt the crown and turn it into a solid block. All Archimedes would have to do was measure the block, figure out its volume, and compare its weight to an equal volume of pure gold. The problem was that the king would not allow his new crown to be melted. Archimedes was stumped. One day, when getting into his bathtub, he noticed that some of the water splashed over the sides and onto the floor. He suddenly realized that an object submerged in water would displace or push away an amount of water that was equal to the object's volume. All he had to do was stick the crown in a tub of water, measure how much water it displaced, and he would know the volume of the crown. Archimedes was so excited that he shouted "Eureka!" meaning, "I have found it!" As the story goes, he ran naked in the streets proclaiming his success.



In the following activity, you will predict the relative densities of different objects found around the house, and then use Archimedes' principle of displacement to test them out. We only ask that while conducting your experiments, please keep your clothes on!

The stuff you'll need

A kitchen scale or home-made balance (see "How to Make a Balance Scale," January 1997 Reflections); a tall drinking glass; a metric ruler; scissors or Exacto knife; a crayon or marker; water; a pencil or pen; and a data sheet.

You also will need to collect a variety of objects for this activity. They should sink in water, be about the same weight, be made of different materials and be small enough to fit inside the drinking glass. For example, grapes, paper clips, balls of clay or pieces of wood.

Here's the plan

1. Fill the glass 1/2 full of water. Use the crayon or marker to carefully mark the water line on the outside of the glass. Choose household objects to weigh.

2. Use the kitchen scale or home-made balance to weigh the objects one at a time. If you are using a home-made balance, compare one object against all the rest. You can use any object that balances against that first object. Set them aside in a group. If you are using a kitchen scale, weigh all objects, setting aside those that weigh the same in a group. Continue until you have six objects that all balance each other (weigh the same).

3. List the six objects on the data sheet.

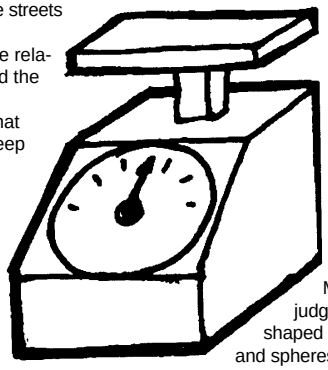
4. Hold the objects in your hand and compare the amount of space they take up. Predict which is the most dense and which is the least dense. For the most part, the more dense an object is, the less space it will take up for the same amount of weight. Rank them in order of 1 to 6 with 1 being most dense and 6 being least dense. If two objects feel like they are the same density, give them the same ranking. Record the rankings on the data sheet in the "prediction" column.

5. Gently place one of the objects in the glass. Be careful not to splash any water out of the glass. What happens to the water level in the glass?

6. Allow the water to settle. Place a ruler against the side of the glass and measure how many millimeters the water level rose above the crayon mark. Record the number on the data sheet in the "displacement" column.

7. Repeat steps 5 and 6 using the remaining objects one at a time. Remember to record your data on the sheet.

8. The object that displaced the most water is the least dense, it is ranked "6." Record this number in the "actual density" column on the datasheet. The object that displaced the least water is the most dense, it is ranked "1." Record this number in the "actual density" column. Use this information to rank the remaining objects. If two objects show the exact same displacement, give them the same ranking.



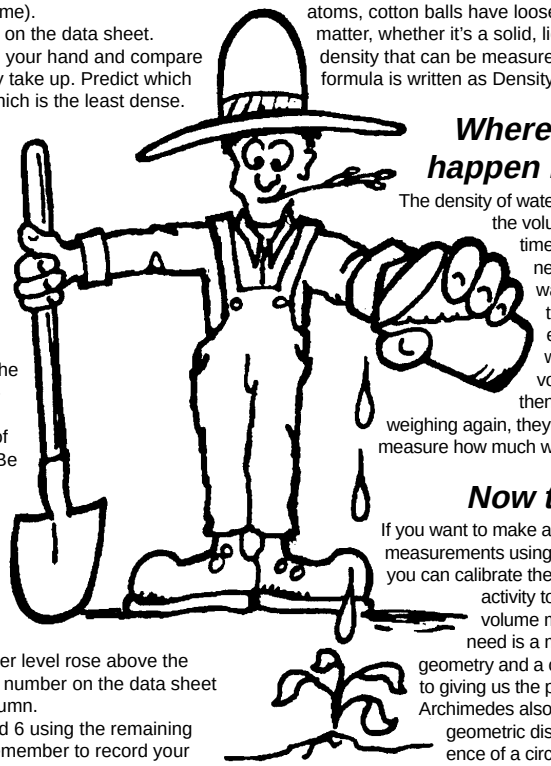
9. How did the actual density rankings compare with your predictions? Why was it necessary to use only objects that would sink in water? What mistakes may have affected the accuracy of your results?

Wrap-up

Most people are fairly good at judging the volume of regularly shaped solids like cylinders, squares and spheres. But many people have difficulty estimating how much space an irregular object takes up. Since each object you used had a different shape, it may have been difficult to relate one volume to another. By selecting objects that would sink, you made certain that they all displaced the maximum amount of water. If you used an object that floated, like a cork, the volume measurement would be much too low because it would have only displaced the water for the submerged part rather than the entire object. In order for your calculations to be accurate, all of the measurements for both weight and volume must also be accurate. A small error in either value would alter the calculated density of the object.

What's going on here?

In technical terms, an object's density is controlled by the type of atoms that make it up and how tightly those atoms are packed together. The more tightly packed the atoms are, the more dense the material will be. Bricks have tightly packed atoms, cotton balls have loosely packed atoms. All matter, whether it's a solid, liquid or gas, has a density that can be measured. The mathematical formula is written as Density = Mass/Volume.



Where does this happen in real life?

The density of water is used to calculate the volume of soil. During times of drought, farmers need to know how much water they can put into the soil without causing excess runoff. By weighing a known volume of dry soil and then saturating it and weighing again, they can accurately measure how much water they need to add.

Now try this

If you want to make accurate density measurements using the metric system, you can calibrate the glass you used in this activity to give you exact volume measurements. All you need is a metric ruler, a little geometry and a calculator. In addition to giving us the principle of buoyancy, Archimedes also made a startling geometric discovery: the circumference of a circle is always 22/7 times greater than it's diameter. This fraction 22/7 is better known as the symbol "pi." In a decimal number, pi is rounded off to 3.14. By using the mathematical formula for the area of a circle, you can measure actual volume changes in the glass. Start by measuring the diameter across the top of the glass. Make sure you use centimeters. Now, divide this number by 2 to get the radius. Multiply the radius by itself and then multiply that number by pi (3.14) and you'll have the area across the top of the glass. Multiply that number by the change in the level of the water in the glass, and you will have the volume in cubic centimeters of each centimeter of water displaced inside the glass.

For example: Let's say your glass has a diameter of 6 centimeters. That means the radius is 3 centimeters. Multiplying the radius by itself gives you 9 square centimeters and multiplying 9 by pi (3.14) gives you an area of 28.26 square centimeters. If you place an object in the water, and it raises the level exactly 2 centimeters, then you know its volume is about 56.5 cubic centimeters. This may sound confusing at first, but with a little practice, you'll be a displacement expert in no time!

This month in history

March

1771 — John McLean establishes the first U.S. laboratory of chemistry at Princeton University

1852 — The first cartoon is published showing "Uncle Sam," who is based on a real U.S. officer, Samuel Wilson

1926 — Robert Goddard flies the first rocket powered by liquid fuel

1933 — President Franklin Roosevelt conducts his first "Fireside Chat"

1939 — Madrid surrenders to Franco, ending the Spanish Civil War

1951 — Edward Teller and Stanislaw Ulam publish a paper setting forth the Teller-Ulam configuration for the design of a thermonuclear weapon

1954 — Edward R. Murrow criticizes Sen. Joseph McCarthy on the television program "See It Now"

1963 — The first issue of the Los Alamos Monitor newspaper is published

1973 — The Atomic Energy Commission declassifies 166,910 documents in five weeks, in accordance with Executive Order 11652

1986 — An international conference is held in Santa Fe to assess the feasibility of implementing the Human Genome Project

1989 — The tanker Exxon Valdez runs aground in Prince William Sound, Alaska

1999 — The first shipment of waste leaves the Laboratory for the WIPP site in southeastern New Mexico (above)

Syndicated material

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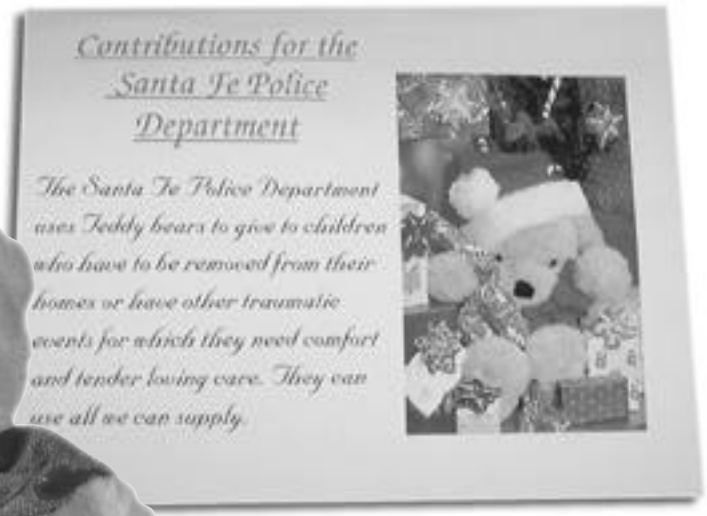
A toy story

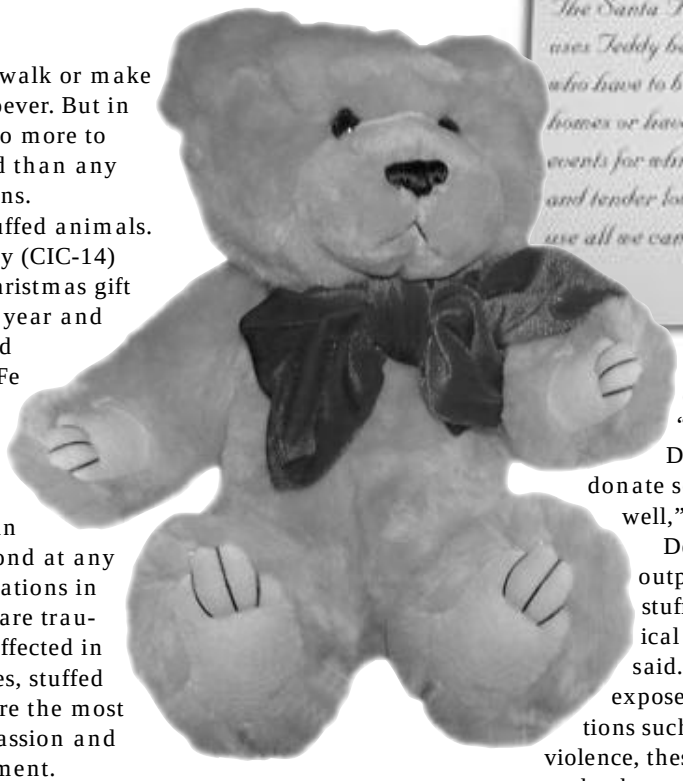
by Ternel N. Martinez



They may not talk, walk or make any movement whatsoever. But in many instances they do more to comfort a child in need than any person's words or actions.

Ah, the magic of stuffed animals.

The Research Library (CIC-14) canceled its normal Christmas gift exchange practice last year and instead collected stuffed animals for the Santa Fe Police Department. Most SFPD officers keep one of these furry, huggable little creatures in their cars in case they have to respond at any time of the year to situations in which young children are traumatized or otherwise affected in some way. In such cases, stuffed animals many times are the most effective tools of compassion and caring for law enforcement.



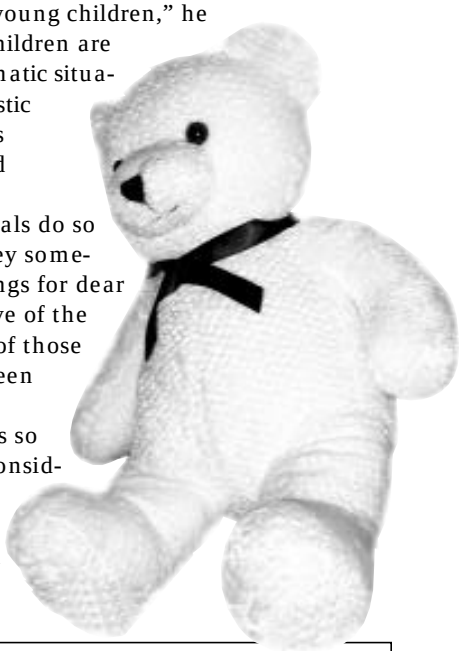
Ann Boland of CIC-14 said her husband actually came up with the idea of collecting stuffed animals for the SFPD. "I'd been involved in a similar program before when I worked in another group, so when he suggested we start a stuffed animal drive in the Research Library, I thought it was a good idea," Boland said.

The rest of the group obviously thought so, too. Immediately after receiving the green light, Boland was on the phone to SFPD Chief John Denko. She personally delivered 34 teddy bears, doggies, reindeer and other stuffed animals to the department on Dec. 18.

Colleague Roseanna Rondeau-Fisher, who brought in two big white teddy bears for the drive, said, "I know that if I had suffered a traumatic experience as a child, I would have wanted something big and fluffy to hold on to. I'm sure in some cases it's all they have left in the world."

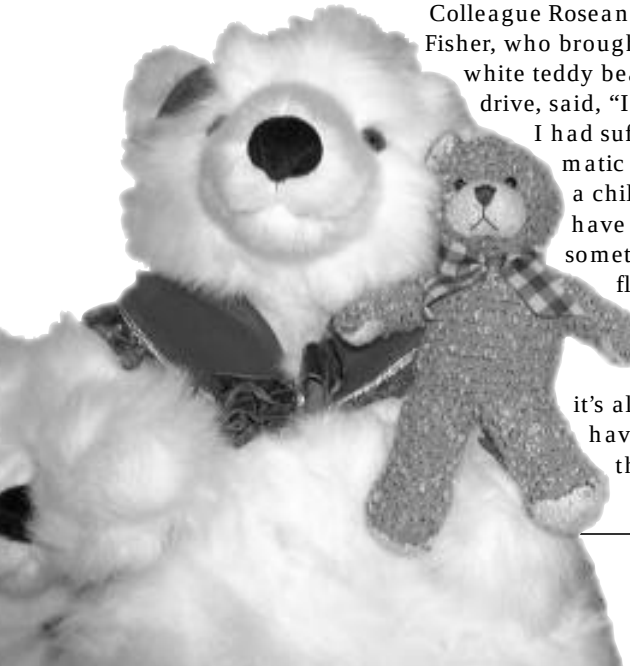
Doug Chafe said his eight-year-old son even donated one of his own teddy bears for the cause. "My wife works at the Los Alamos Police Department, and she got permission to donate some of its stuffed animals to the SFPD as well," he added.

Denko was only too grateful for CIC-14's outpouring of compassion and concern. "These stuffed animals have a very positive psychological effect on young children," he said. "When children are exposed to traumatic situations such as domestic violence, these animals can make them calmer and more responsive."



He added, "These animals do so much for the children. They sometimes hold on to those things for dear life. We're very appreciative of the gifts we receive on behalf of those whose little worlds have been turned upside down."

Last year's program was so successful that CIC-14 is considering making it a year-round effort. For more information on the stuffed animal program, contact Boland at 7-4448.



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