Reflections

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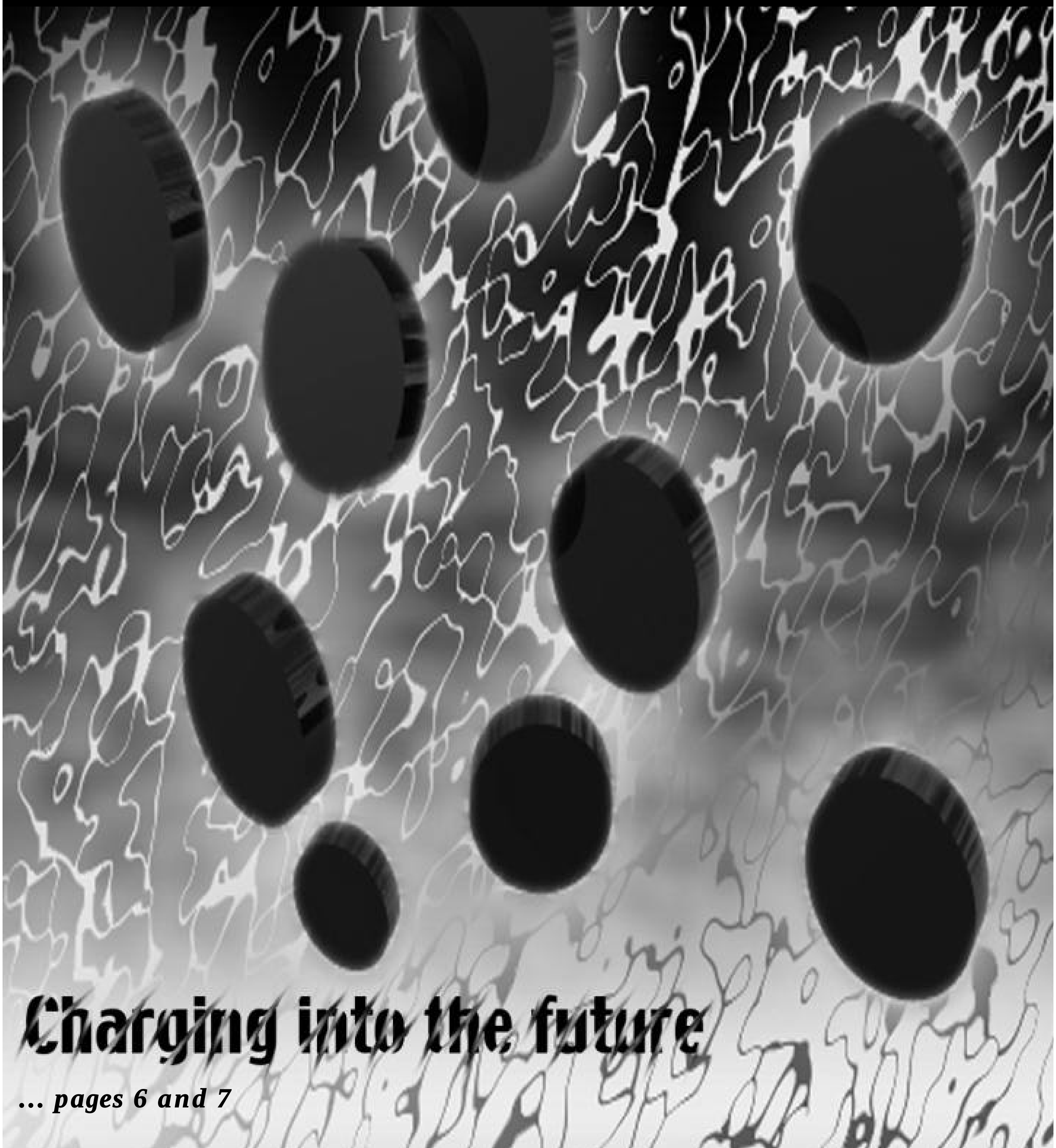

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A Department of Energy/University of California Laboratory

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Cover illustration by Ed Vigil

Reflections

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

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editor's journal

Volunteering ... a powerful force for change

Remember when you were in elementary school and your teacher asked for volunteers to take on some special responsibility around the classroom, say feeding the hamster or erasing the blackboard? If you were like many elementary-age children, you eagerly thrust your hand in the air, waving it about hoping to be picked. Now fast forward several years. Do you now find yourself among those who shift uncomfortably in their seat or sit in silence, avoiding eye contact, when a request is made for volunteers?

Somehow over the years, many of us have come to feel that the only thing worse than volunteering is to be volunteered. And in all fairness, those who have reached this conclusion often have had some less-than-rewarding experiences, such as volunteering to feed a neighbor's vicious dog or being volunteered for carpool duty — again and again. Fortunately, most of us have not been soured on volunteering. And this is evident by the volunteer spirit of Lab employees and retirees.

Oh, there may be widespread hesitancy to join a Lab task force, take part in a survey or head up an office party committee. But when volunteering really counts, Lab employees are there. Think about it. Some employees share their expertise, energy and insight by serving on community and state boards or committees. Others are involved with education efforts in Northern New Mexico, such as mentoring and tutoring (see related article on Page 12). They travel to various locations after work hours to help students with a variety of subjects, ranging from math and science to grammar and reading. Some employees serve on science fair panels or work with students on special projects. A few years ago, one employee was recognized nationally by the Department of Energy for her outstanding tutoring efforts at a local pueblo.

You may know some of the Lab employees and retirees who routinely spend time during the Thanksgiving holiday dishing up food at shelters so the homeless and the needy can have a special meal. You may be one of the many employees who help collect food and clothing for those in need during the winter holidays, or one of those who volunteer to pick up trash along the roadsides to help keep our state beautiful.

And let's not forget about the employees who put in a lot of time and sweat with Habitat for Humanity, a program that builds housing for the poor. It's not easy work, but most volunteers say they truly enjoy helping build houses for those in need. Then there are employees like the "rooters" who give of their time to help improve worker and workplace safety at the Lab (see article on Page 4), and individuals like Wendee Brunish of Earth and Environmental Sciences (EES) and Debbi Maez of the Special Projects Office (S-SPO) who travel throughout and beyond New Mexico with their search dogs, providing assistance where needed (see article on Page 5). The list of things Lab employees volunteer to do on their own time goes on and on.

The Laboratory supports the volunteer spirit through its Community Relations Office, which recently established a Volunteer Program. The program serves as a clearinghouse to match volunteers with the needs of the surrounding communities and currently focuses on three main areas: tutoring, mentoring and working with Habitat for Humanity. For more information about the program, contact Tonya Suazo at 7-5774 or write her via e-mail at *volunteer@lanl.gov*.

Guardian of Laboratory history

by William Heimbach

The eminent Manhattan Project physicist and future Nobel Prize winner Emilio Segré had worries other than his specialty, spontaneous fission. "My apartment is too hot. When can you fix it?" he wrote in 1943.

Norman Ramsey, another Nobel laureate-to-be, corresponded regarding his biggest concern before he moved to Los Alamos to join the atomic-bomb effort. "Where can I buy diapers?" he asked.

The pieces of paper containing these thoughts are among the voluminous treasures of time neatly organized in 14-foot high rows of shelves spread across several large rooms at the Laboratory Archives and Records Center.

Roger Meade, the Laboratory's archivist-historian in Information and Records Management (CIC-10), stands among the voluminous treasures of time neatly organized in 14-foot high rows of shelves spread across several large rooms at the Laboratory Archives and Records Center. *Photo by LeRoy N. Sanchez*

Housed in a concrete building off Trinity Drive in downtown Los Alamos, this guardian of history sits not far from where the history of an era was made. A 10-minute walk would have taken Oppenheimer from the World War II-era Lab that encircled Ashley Pond to the present-day Archives, where his triumphs and tribulations are carefully categorized and stored.

"Keeping these historically significant records makes every day a great day," says Roger Meade, the Lab's ebullient archivist-historian and conscientious keeper of the flame.

"This is Los Alamos; it's really unique," he says. "When you come on this mesa, you have to realize that you are at the place where they designed and built the atomic bomb. This place is truly one of a kind."

Meade grew up in northern Michigan and found early on that reading about the past brightened the gray, frigid winters of tiny Gaylord, the hometown he later left to become his family's first college student.

Now, as leader of the 20-person information-research team within Information and Records Management (CIC-10), Meade is responsible for records inventory; information practices, such as Freedom of Information and California Public Records act requests; and other record-keeping provisions required under federal law and the University of California and Department of Energy contract.

All are important to the Laboratory, but some have a more particular hold on Meade. "I have a special place in my heart for the World War II collection," he says of the Archives. "It is very rich and very good."

Drawers of correspondence from Oppenheimer, Groves, Fermi, Teller and Bethe reveal the paper remnants of these scientific celebrities.

"There are more autographs here of more famous people than most other places," says Meade. "You can learn something new every day from the records."

Los Alamos' Archives, while available on a restricted basis to bona fide scholars and others on official business, must guard against unauthorized intrusions. "We are not a browsing library," Meade says, "and we apply the need-to-know rule to those wishing access."

In fact, 80 percent of the facility's holdings are classified. And while most of the collection is paperwork, there's some interesting exceptions, including camera film from the Trinity test, early neutron generators and high-explosives models.

Meticulously hung in one room are perhaps the most revealing of anthropological relics. Every Los Alamos employee's X-rays from their new-hire physical are here. They must be retained for 75 years after the person leaves the Laboratory.

Meade's office is adjacent to the World War II collection and lined with books of every conceivable historically scientific topic. One of them, "Critical Assembly," is co-authored by Meade. Its 508 pages walk the reader through the technical drama and personalities of Los Alamos' war years.

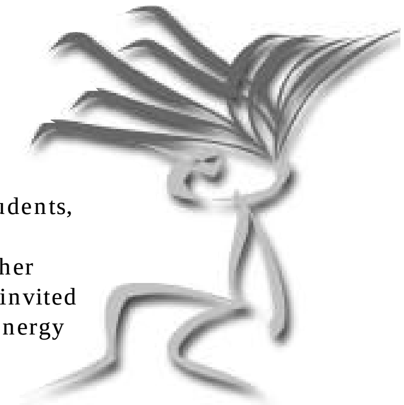
Published by the prestigious Cambridge University Press in England, the book was a complicated and, at times, burdensome task for Meade and three colleagues to complete.

"It took twice as long to write the book about building the bomb than actually building the bomb," he smiles. The published result stands tall in the critical reviews of historical tomes.

It is a testament to the genius and sweat of Los Alamos' scientific settlers. And to the archivist-historian who helped produce it.

"This is a lot more than a job," reflects Meade. "It's an avocation and it's a love and it's a constantly humbling experience. The longer I last here, the more I realize how little I know about the place."

Sowing the seeds of safety



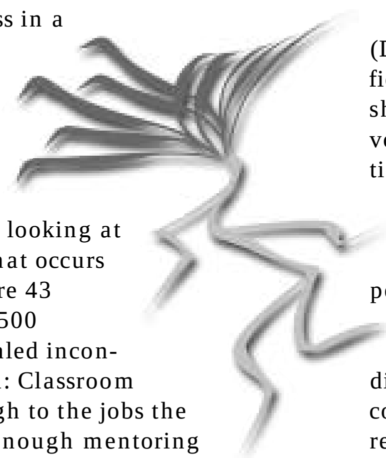
by Kathy DeLucas

The key to a healthy lawn, landscapers say, is a strong root system. Similarly, one of the keys to a good safety program at the Laboratory also may be in the roots — the grassroots organization, that is.

The grassroots organization, or "rooters" as its members call themselves, started more than a year ago as an organization of about 60 volunteers who say they are committed to workers and workplace safety.

Individuals leave their organizational hats at the door during Tuesday lunch hours to discuss how they can make a difference in improving safety at the Lab.

"Grassroots is a concept," says member Cam Campbell from Security Plans and Programs (S-1). "When the Lab makes decisions and doesn't involve employees, those decisions may not be the best for the institution. The grassroots organization can communicate with managers and give a valuable employee perspective before they make those decisions. All in all, it makes a better workplace."



The "rooters" have made progress in a very nontraditional way. With no turf issues and no individual status concerns, the group is ready to act on future safety concerns. The most recent project the group has tackled was student safety mentoring. When the group started looking at the student population explosion that occurs every spring, it found that there were 43 student programs hosting nearly 1,500 students. Some of the findings revealed inconsistencies from program to program: Classroom training that was not specific enough to the jobs the students were performing and not enough mentoring or on-the-job training.

"The key for me was to start with the students," said Robert Gonzales, Nuclear Materials and Accountability (NMT-4). "We place a lot of value on our students since they are our future workforce."

After involving upper management and following the instruction of using existing resources and developing solutions, the "rooters" worked closely together with the student organizations to solve problems with mentoring and training. The solutions that the grassroots organization developed also can be applied to new hires or people who change jobs.

"If someone looks at a student differently than a new hire, that's wrong," Campbell said. Improvement in all these areas and better follow through could prepare all new employees not simply students, he said.

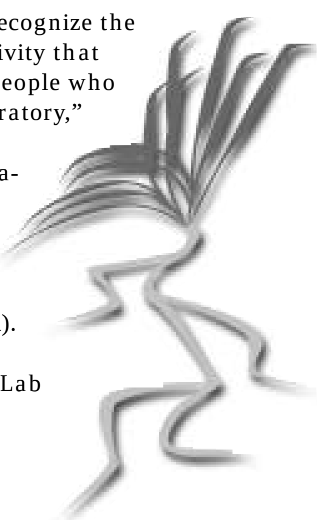
The group celebrated another success last December. It was invited to meet with Department of Energy officials and subject matter experts from Dow, Dupont and the National Safety Council to discuss how the Lab's safety program might improve. The grassrooters provided valuable insight and information to the panel about the employee perspective on workplace safety and how it might be communicated and improved.

As an organization, the "rooters" are committed to bring new people and fresh ideas to look at the ways workers perform the work. Recently, Johnson Controls Northern New Mexico and Protection Technology Los Alamos joined the grassroots safety effort. For their next project, the "rooters" may be reviewing the amount of paperwork involved in the safety process. The group believes that rules place too much emphasis on having the proper paperwork done, rather than focusing on the aspect of how the work is conducted.

Ken Uher is a "rooter" and an environment, safety and health officer in High Explosive Science and Technology (DX-2). When he took the job, he thought he'd be in the field providing support for the researchers. Instead, he shuffles papers that have grown, he says, into a huge volume of paperwork pulling him away from the operational aspect of ES&H.

"When we participate in safety-related audits, the inspectors always want to see the paperwork," Uher said. "Not once has an auditor asked to see ES&H people support the workers."

The "rooters" have seen the positive benefits from nontraditional meetings. "We recognize the different skills, experience and creativity that come from such a diverse group of people who represent a cross-section of the Laboratory," Toby Turner of Fire Protection (F-2) said. "This is one of the first organizations in which even only five minutes of your time is still a valued contribution."



"We're all in this together," said Fran Talley of Public Affairs (PA). "We put the negativity and the turf battles aside to work together. If the Lab succeeds, we all succeed."

For more information on the safety grassroots organization, send e-mail to *rooters@lanl.gov* or call Talley at 7-5225.

Dogged determination in twister's wake

by James E. Rickman

After deadly tornadoes roared through the Oklahoma City area on May 3, a disaster task force from the Federal Emergency Management Agency called in the dogs. That's how two Lab employees and their canine companions found themselves searching for corpses among piles of debris in the heart of Tornado Alley.

"We got a call from FEMA at about 9 o'clock at night on Wednesday, May 5," said Debbi Maez, an employee of the Lab's Special Projects Office (S-SPO). "We were out the door and on our way to meet a plane in Albuquerque at 3 a.m. Thursday morning. That's how these things work."

Maez and Wendee Brunish, an employee in the Lab's Earth and Environmental Sciences (EES) Division Office, had just hours to pack essential gear and at least a day's worth of food and water for themselves and their dogs, Duke and Miranda, before they hit the road. And shortly before the crack of dawn Thursday, the team found itself on a plane bound for Oklahoma City.

"Normally FEMA has its own certified search dogs, but those dogs are trained to search for live-human scent," Brunish said. "At the time we got the call, there were more than 150 people unaccounted for, so FEMA needed dogs who were certified to search for bodies. That's why they called us."

Duke, a 7-year-old Brittany, and Miranda, a 6-year-old mixed breed rescued by Brunish from an animal shelter, have had extensive training in locating corpse scent. In countless training exercises, the dogs have gone through their paces to locate pieces of dead tissue below ground and above ground within tight time constraints to certify that they were up to their grisly, yet important task. The dogs have to train their noses for actual dead human tissue, so, says Maez, "You get to know doctors and dentists who can give you small samples that you can use to train your dogs."

Wendee Brunish, left, of the Earth and Environmental Sciences (EES) Division and Debbi Maez of the Special Projects Office pose with their dogs, Miranda, left, and Duke. Brunish, Maez and their dogs were called in by a disaster task force to held search for corpses among the piles of debris following the deadly tornadoes that roared through the Oklahoma City area May 3. *Photo by LeRoy N. Sanchez*

Thursday afternoon Maez, Brunish and their dog detectives started searching through the devastation in three communities near Oklahoma City. Other teams searched elsewhere for the living and the dead.

"The tornado had torn a path that was 19 miles long and up to a mile wide," Maez said. "The damage was amazing. Entire neighborhoods had been leveled. In some areas, the only way you could differentiate one house from the next was by looking for the driveways. It was like walking through a great big landfill; there was just this one continuous, long heap of rubble."

Yet, the line between ruin and redemption in some areas was thin.

"Another amazing thing was that you'd go into a neighborhood and you'd find all the houses on one side of the street demolished, but the houses on the other side of the street would have just a few shingles missing from the roof or they'd have no damage at all," Brunish said. "At one place, there were these two untouched lawn deer standing in front of this totally smashed house."

Because of the massive destruction, emergency-management personnel in the area were anxious to begin cleanup. But before cleanup could begin, all rubble had to be checked to make sure that the dead weren't hidden among the splintered boards and scattered memorabilia that marked the tornado's wake. Maez, Brunish, Duke and Miranda were responsible for checking the rubble in their assigned neighborhoods, and they made slow progress through the ruination, marking the driveway of each checked residence with spray paint.

In some areas, the fetid stench from toppled refrigerators made Maez and Brunish fear the worst. But the dogs' sensitive noses weren't fooled by the decay. At one point during the three-day search, the dogs alerted their masters to a find — it turned out to be an area where a body already had been removed.

In the end, their mission had a happy ending: They didn't find any corpses; and most of the missing were accounted for alive, although 41 people had died as a result of the tornado's fury and many others were injured.

The search gave Maez and Brunish an appreciation for the resiliency of the human spirit.

"Here's this disaster area, and everybody we'd meet would be really nice; everybody wanted you to know that you were appreciated," said Brunish.

"And people would do things like write 'Yard Sale' on boards and put them up in their yards, or they'd put 'For Sale — Real Fixer Upper' signs on what was left of their houses," said Maez.

The team also was duly impressed by disaster relief efforts in the area.

"It was pretty impressive how quickly they got things set up," Maez said. "Every school and church was being used to feed and shelter people and as food and supply distribution centers."

Of course, Brunish and Maez were impressed by their four-legged friends, who are supported in part by the local United Way.

"I was very proud of our dogs," said Brunish. "They worked very hard and did what they were supposed to do. They did their jobs."

Ultracapacitors: Charging into the future

by Todd Hanson

Imagine a battery-like device the size of a dime capable of being recharged millions of times and delivering as much power in each discharge as a battery 10 times its size. A recent discovery at the Laboratory has brought such devices closer to reality.

These ultracapacitors, as they are being called, have the potential to impact nearly every area of electrical energy use, from transportation to communications to computing. Their ability to replace conventional batteries or capacitors in various applications, or to be coupled with batteries in other applications, makes them part of a new generation of power sources with combined high-energy and high-power densities. This means they can hold substantial energy and power in a small volume.

Researchers in Electronic and Electrochemical Materials and Devices (MST-11) built on a patent granted to the Laboratory in 1996 for the discovery of a family of conducting polymers that act as highly effective charge storage materials. The researchers have created a new single-cell ultracapacitor by electroplating the unique conducting polymer material onto microscopic carbon fibers woven into the form of a paper-thin disk. The polymer-coated carbon paper disk is covered with a porous separator, and electrolytic solution is added before sealing the device.

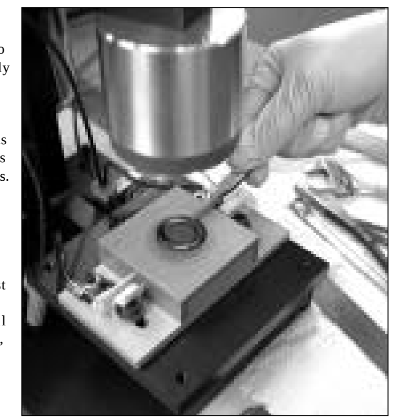
Using these unique materials and morphology, the researchers were able to achieve 2.7 million charge/discharge cycles for a single ultracapacitor device. Quite a feat, considering a typical battery attains an average of several hundred to several thousand charge/discharge cycles in its lifetime.

The group's latest successes with ultracapacitors are only the beginning of the story.

In terms of power source properties, ultracapacitors lie somewhere between a battery and a capacitor. Conventional batteries provide stored energy for extended periods of time, but have peak-power and cycling limitations. They produce and cycle energy using chemical reactions. Because of the chemical reactions that occur within the battery, they have limited ability to charge and discharge energy repeatedly and quickly.

Conventional capacitors are capable of repeatedly providing high levels of power, but can hold very little energy. As a result, they often cannot discharge this power for more than a few microseconds.

Ultracapacitors combine the best of both worlds. They store high levels of energy in a small volume and then release that energy in power bursts. In an automobile application, for example, a vehicle might use this burst of power to accelerate or climb a hill. Because ultracapacitors move electrical charges between conducting materials, rather than perform any chemistry, they maintain an ability to cycle far longer than batteries. Ultracapacitors, by their very design, are lighter and smaller than batteries with comparable peak-power levels.



Encapsulating the ultracapacitor core. *Photos by LeRoy N. Sanchez*

The advantage of the Los Alamos ultracapacitor over other ultracapacitors currently in development or on the market is the conducting polymer's open molecular structure and the electrode's open microstructure. Together they create a large surface area and allow for higher electronic and ionic connectivity to all charging sites in the conducting polymer.

The group's latest successes with ultracapacitors are only the beginning of the story. The current amount of conducting polymer in the ultracapacitor is a mere 10 percent of the total weight, but the group's near future goal is to reach 25 percent. Reaching this goal, as well as additional planned device structural improvements, could increase the ultracapacitor's energy density to four or five times its current level.

If this happens, either the ultracapacitors of the future could be made even smaller while maintaining equivalent power output levels, or far more powerful ultracapacitors could be built that are the same size as current ultracapacitors. Each of these directions shows significant promise. A smaller equivalent-power ultracapacitor could help miniaturize many areas of conventional electronics and a large, powerful capacitor could find many industrial and transportation applications.

The conducting polymers used in the Laboratory ultracapacitor are the result of a collaboration with chemical researchers at the University of Texas in Dallas who continue to create the starting material, called a monomer, used to make the conducting polymer.

The original Los Alamos research into conducting polymers began as part of the Laboratory Directed Research and Development program in the late 1980s. The success of the LDRD project led to funding from the Department of Energy's Office of Transportation Advanced Industrial Materials. The Central Intelligence Agency provides current funding for the program.

The members of the Lab's ultracapacitor research team are Shimshon Gottesfeld, Steven Shi, Xiaoming Ren and John Davey, all of MST-11.

Serendipitous discovery: From unexpected impurity to vital additive

by Todd Hanson

Over the past few years, the starting materials, or monomers, provided by John Ferraris' team at the University of Texas in Dallas for making conducting polymer active materials for ultracapacitors have been of the highest quality. The team's expertise in organic chemistry provided the foundation for the development of the ultracapacitor, yet it was an impurity in one batch of monomers that led to a breakthrough in ultracapacitor research.

Last summer, Steven Shi of Electronic and Electrochemical Materials and Devices (MST-11) was fabricating an ultracapacitor using conducting polymer as the electrode active material. The polymer was electropolymerized from its monomer solution onto a carbon paper disk bonded to a current collector.

Shi had used up one batch of the monomer and was starting with a fresh batch — subsequently named the "April batch" — when the disk displayed a rusty red color, rather than the usual black. Instead of discarding the material and starting over, Shi decided to investigate.

He found that the rust-colored disk was significantly superior to the original black in terms of polymer morphology and material stability. The red material had a highly porous, open structure, with polymer grain size in the sub-micron range, while the black material showed a relatively compact structure with polymer grain size in the range of several microns.

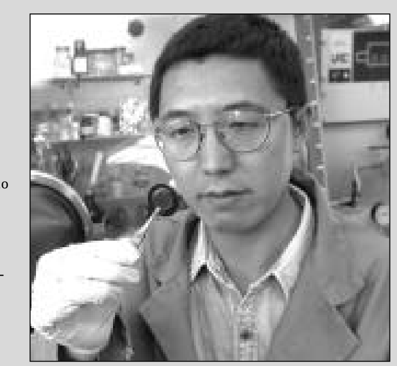
The new morphology provided a large, effective, electrolyte-accessible polymer surface area, leading to fast charge/discharge dynamics. More surprisingly, the red material also helped extend the device cycle life in pulsed discharge mode from 100,000 cycles to 2.7 million cycles.

Shi brought this discovery to the attention of principal investigator Shimshon Gottesfeld, also of MST-11, who suggested that Shi test subsequent batches. Using newer batches of the monomer, the electrodeposited polymer returned to its ordinary black color, and the cycle life of the ultracapacitor dropped back to 100,000 cycles. It was clear that the April batch was an anomaly.

Gottesfeld suggested that Ferraris re-analyze the April batch, and the Texas team confirmed that it contained a previously undiscovered component. The impurity had been hidden during the initial analysis beneath a large spike in the gas chromatography spectrum — an analytical method used to determine the chemical components of complex mixtures. It was easy to miss.

Using information gained from the analysis, Shi added the component to a solution of the pure monomer and electropolymerized the active material from that mixed solution. The resulting polymer showed the same superior properties as the April batch. Somehow, the impurity had improved the quality of the conducting polymer. The unexpected component has since been promoted from an impurity to a vital additive.

Uncertain as to exactly what makes the new conducting polymer more robust — either the second component strengthens the conducting polymer's bonding to the carbon or provides cross-linking in the polymer — the Los Alamos researchers continue to investigate, aiming at further improvements in ultracapacitor technology.



Steven Shi of Electronic and Electrochemical Materials and Devices (MST-11) examines an ultracapacitor prototype.

CST student is co-valedictorian at Española High

Danielle Sanchez

Danielle Sanchez, an undergraduate student in the Chemical Science and Technology (CST) Division, finished first academically in her senior class at Española High School this year.

Sanchez, who found out about working at the Laboratory while competing in the New Mexico High School Supercomputing Challenge, and a classmate each achieved a 4.0 grade point average in high school and were named co-valedictorians.

"It's an honor for me," she said. "We [the top students in the class] all worked so hard, and it's rewarding to be recognized like this."

Sanchez began working in the CST Division Office in October 1997 as a member of the CST Web Team. She has worked on the division's periodic table, an interactive web resource that provides information about the elements, and on form definition files, which are the interfaces between the web and a number of databases that store information.

She enjoys her work at the Lab. "My boss, Tina Skinner, is really encouraging," she said. "She's given me a lot of independence and freedom to handle projects that require me to learn new skills. It's been an educational experience."

In her freshman and sophomore years, Sanchez entered the Supercomputing Challenge, a Laboratory-sponsored, statewide competition in which teams of high school students research scientific problems and write programs to solve them on supercomputers.

The second year, her team finished second for a project modeling the carbon dioxide uptake by the Mediterranean Sea. Based on the same work, she and a classmate finished first in the regional science fair this year, then placed third in the statewide science fair.

Sanchez, who lives in the town of Chili just north of Española, plans to attend the New Mexico Institute of Mining and Technology in Socorro next fall to study chemical engineering. She has received scholarships from the university and as a result of her achievements at the science fair.

Backhaus wins first Postdoc Publication Prize

Scott Backhaus

Scott Backhaus of Condensed Matter and Thermal Physics (MST-10) is the winner of the first Postdoctoral Publication Prize in Experimental Sciences. The award is jointly sponsored by Damon Giovanielli and the Laboratory. It is awarded for the best article in experimental sciences. The prize will be given every other year.

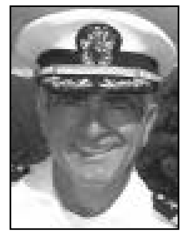
Backhaus, a Postdoctoral Fellow at the Lab since January 1998, was honored for his paper, "A Thermoacoustic-Stirling Heat Engine," which was published in the May 27 issue of Nature magazine. The article describes Backhaus' work with Lab Fellow and Backhaus' postdoc sponsor Greg Swift, also of MST-10, on a simple, energy-efficient engine with no moving parts and requiring little or no maintenance that can be inexpensively manufactured. The efficiency of the engine is twice that of other no-moving-parts heat engines.

Backhaus, who discussed his paper at a Lab colloquium June 17, will receive $500 and a certificate. The prize money is provided by Giovanielli, who was a staff member at the Lab for 21 years, the last six as Physics (P) Division leader. He is currently president of Sumner Associates, a scientific consulting company.

Backhaus graduated from the University of Nebraska in 1990 with a degree in engineering/physics. He received his doctorate in physics from the University of California, Berkeley in December 1997.

For more information regarding the prize, contact Mary Anne With of the Education Program Office (STB-EPO) at *with@lanl.gov*.

Employee honored by U.S. Navy



Bill Verzino

Bill Verzino of Space Data Systems (NIS-3) was cited for his outstanding achievement as a member of the Office of Naval Research judging team at the International Science and Engineering Fair on May 4-7.

The commendation was presented by the Chief of Naval Research, Rear Admiral P.G. Gaffney.

Although Verzino retired from the Naval Reserve as a captain in 1994 after 36 years of service, he continues his activities for the Navy.

Verzino has helped the Navy Department's Naval Science Awards Program for 15 years. This program provides scholarships to encourage high school students to pursue careers in science and technology fields of naval interest. It already has supported hundreds of novice engineers and scientists by encouraging and assisting development in their careers.

In 1982 Verzino took a leave of absence from the Lab and volunteered for two years of active duty to teach chemistry at the U. S. Naval Academy. During this time, he became qualified as a Naval Academy information officer and continues to recruit and interview prospective midshipmen in Northern New Mexico.

Verzino received a bachelor's degree in chemistry at Muhlenberg College, Allentown, Pa., a master's degree in analytical chemistry at John Carroll University, Cleveland, Ohio, and a doctorate in organic chemistry at Colorado State University, Fort Collins, Colo. He has worked at the Lab for 21 years.

June employee service anniversaries

35 years
George Royer, ESH-10

30 years
Lawrence Garcia, NIS-6
Frank Maestas, NIS-4
Federico Martinez, ESA-DE
Nicholas Nagy, CIC-DO
Michael Piotrowski, NIS-3
Raymond Romero, ESA-EPE
Jose Talachy, ESA-DE
David Warren, LANSCE-8

25 years
J.F. Briesmeister, X-CI
George Chandler, DX-3
Jack Comly Jr., X-CI
Allen Gualer, ESA-MT
Lash Hansborough, LANSCE-2
Carla Jacquez, ESH-18
Edalia Lucero, DIR
Robert Meier, ESA-EA
Jose Romero, BUS-7
Larry Sanders, DX-7
Vicente Sandoval, NMT-5
Allen Trujillo, F-2
Andres Trujillo, ESH-5
Richard Valerio, BUS-8
Fred Wampler, CST-DO
Bradford Wright, P-22

20 years
James Balkey, NMT-7
David Brown, MST-11
Martin Crow, ESA-DE
Gerald Demill, DX-5
Gloria Dunning, CIC-13
Scott Evans, P-24
Anita Flores, CIC-1
Robert Gibson, P-24
Ward Hawkins, EES-1
Thomas Hurry, P-24
W. Wayne Kinnison, P-DO
Gerald Lucero, ESA-TSE
Patricia Lyon, TSA-11
Celine Martinez, DX-1
Jane Martinez, BUS-3
Lorraine Martinez, ESA-DE
Evan Noveroske, NIS-3
Walter Treadaway, ESH-17
David Tubbs, X-TA
Stephen White, NIS-3
Michael Whitehead, CST-6

15 years
Frank Abeyta, DX-8
William Bostwick, CIC-ACL
Jay Carnes, ESA-TSE
Micheline Devaurs, EES-15
Ronald Dolin, ESA-EA
Margaret Durbin, CIC-1
James Dyke, NMT-1
James Faulkner, P-24
David Finnegan, CST-7
David Guenther, NIS-2
David Huerta, NMT-5
Duncan MacArthur, NIS-6
Stephen McCleary, F-1
Barbara McInroy, EM-SWO
Bill Papatheofanis, NIS-9
Ronald Pfaff, CIC-8
Viola Quintana, NMT-2
Allen Romero, F-1
Gerald Schotik, ESA-WE
Susan Seestrom, P-23
Donna Smith, CIT-IP
Kathryn Smith, NIS-3
Jeffrey Stoddard, NMT-3
David Torney, T-10
Chang-Shung Tung, T-10
Larry Vaughan, ESH-10
Gerald Veazey, NMT-2
Phillip Warnock, PM-4
Barbara Weintraub, PM-3
Thomas Zocco, NMT-11

10 years
Lorraine Abney, BUS-2
Marc Alvarez, CST-4
John Buksa, TSA-10
Ellen Castille, LC-LEL
Tonya Collins, MST-6
Joe Gonzales, F-6
Robert Gurule, CIC-8
Diane Hansen, CIC-4
Jeffrey Holander, ESH-5
Harry Jenkins, DX-7
Margery Lewis, HR-5
Ronnie Mainieri, T-13
Michael Mattis, T-8
David McIntosh, F-3
Eric Montoya, ESA-WE
Michael Neergaard, NIS-9
Karen Pao, CIC-19
Gregory Payne, CIC-4
Kenneth Purtee, CIC-18
Daniel Rees, LANSCE-5
Amy Regan, LANSCE-5
William Rider, X-HM
Michael Shinas, DX-3
Roy Spencer, EM-SWO
Patrice Stevens, NMT-15
David Suszcynsky, NIS-1
Robert Sutherland, CIC-12
Ross Tapia, BUS-8
Timothy Thomas, NIS-IT
Sandra Villa, BUS-4
Tony Warnock, CIC-3
Patricia Wright, NMT-15
Thomas Yoshida, CST-9

5 years
Jeremy Boak, EM-TD
James Downs, S-6
John Fitzgibbons, S-1
Daniel Garcia, ESH-4
Robert Hanrahan, MST-6
John Hargreaves, NMT-5
Diana Hollis, EM-ER
Lilia Jimenez, ISEC
Russell Johns, TSA-10
Kenneth Keeler, ESA-WE
Chad Lauritzen, DX-8
Mark Ledoux, ESA-WE
Cheng Liu, MST-8
Ternel Martinez, PA
Sandra Mecklenburg, NMT-1
Kirk Meekin, ESH-5
Luis Morales, NMT-11
Don Mullins, NMT-2
Charles Nakhleh, X-TA
Trung Nguyen, ESH-5
David Poston, TSA-10
Santiago Rodriguez, NMT-1
Linda Roepcke, CST-12
Natalie Romero-Trujillo, ESH-3
Kimberly Ruud, NIS-4
Mary Stroud, NMT-10
Douglas Thacker, ESA-WE
Shelley Thompson, DX-2
Amy Wong, NMT-1

In Memoriam

Fredrick A. Sterkel

Laboratory retiree Fredrick A. Sterkel died Feb. 26. He was 80 years old. Sterkel was born in Loveland, Colo., and graduated from Loveland High School in 1935. He served in the U. S. Army during World War II in 1941 to 1945. Sterkel attended Emily Griffith Opportunity School in Denver from 1949 to 1950, where he trained as a machinist. He came to work for the Lab in 1951 with Statistics (SD-1) and was employed by the Laboratory for 25 years. He retired as technical supervisor in 1979 while working with Systems and Application Assessment (SD-5).

Elizabeth N. Tynan

Retiree Elizabeth N. Tynan, 80, died March 6 after a long illness. She began working at the Lab in 1954 for IBM Computer Support (T-1) and was working for Operations Support (C-1) when she retired in 1975. Tynan received a state teacher's certificate from the University of Buffalo, where her major was methods and psychology for teaching deaf children.

Filmore F. Criss

Retiree Filmore F. Criss, a losnt-time resident of Los Alamos, died March 11 at his home. He was 80. He was in the U. S. Marine Corps from 1937 to 1945, having served in the South Pacific with the 4th Marine Raider Battalion. Criss graduated from West Virginia University in 1948. He began working for the Lab in 1949 with Weapons Experimental Physics (W-1) and worked for the Laboratory for 28 years. He retired in 1973 while a member of High Temperature Chemistry (CMB-3).

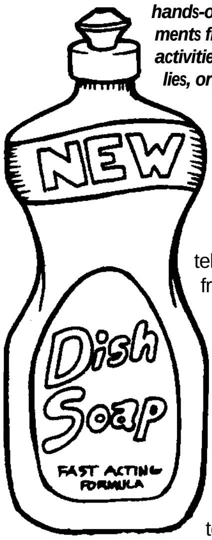
Francis E. Stack

Laboratory retiree Francis E. Stack died March 29. He was 81 years old. He received his bachelor's degree in mechanical engineering from Washington University in St. Louis, Mo., and his master's degree from the University of Illinois. Stack began working for the Lab in 1946 as a staff member in Engineering (Z-4) and retired in 1979. He was a member of the Holy Name Society, Sierra Club and Knights of Columbus. He also carved and donated altars for several Catholic mission churches in Northern New Mexico.

Joseph R. Dion

Former Laboratory employee Joseph R. Dion died April 1. He was 85 years old. He came to work for the Lab in 1951 as a mechanical specialist for Cost Engineering (ENG-4) and retired in 1982. He was a long-time member of the Lions Club, was appointed magistrate judge and served as county treasurer for two years.

"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.



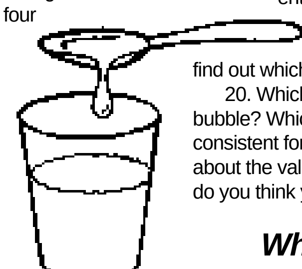
Who makes the best bubbles?

We've all heard it before on television ads. Makers of everything from anchovy pasta to zircon rings all claim that their products are the best! The question is, are they telling the truth? How do they test these things and what does "best" mean anyway? To get to the science behind these questions, we've come up with an experiment that will place you in the role of both chemist and consumer advocate. Your mission is to determine which dish washing liquid makes the "best" bubbles.

Before you get started, some ground rules, which in science are called parameters, must be set up. The most important parameter for this experiment is to decide exactly what "best" means! Best can mean the biggest, or it can mean the longest lasting, or it can mean anything else you decide it should mean. In this case, the best bubble will be the one that has the largest diameter when blown with a straw on a flat surface. Another parameter is to make the experiment a fair test. To do this, you must make sure that the conditions are constant for each trial. In science, variables are the things that can change from experiment to experiment. In a true "fair test" all the variables should remain the same except for the thing you are testing for. In this case the only variable that should change is the brand of dish washing detergent you test. In this activity, you will compare solutions of four different brands of dish washing detergent to decide which one will make the best bubbles, the ones with the largest diameter.

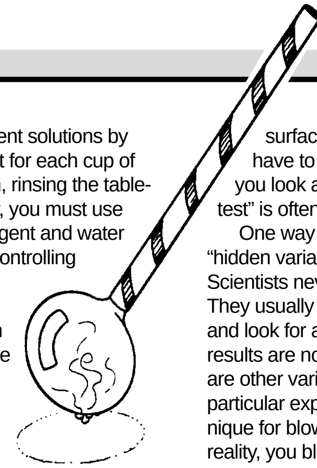
The stuff you'll need

Four different brands of liquid detergent (You'll only be using about a tablespoon of each one, so see about borrowing some); five same sized glasses which can hold more than one cup; four straws for every person blowing bubbles; one dark plastic garbage bag; four colored markers, colored pencils, or crayons; ruler; paper towels; masking tape; measuring spoons; measuring cups; a flat surface; water; and a data sheet.



Here's the plan

1. Lay a garbage bag down on a flat surface.
2. Pour one cup of water into each glass.
3. Set one glass aside as your rinsing glass. You won't put any detergent into it.
4. Pour one tablespoon of one detergent into a glass of water and stir.
5. Use masking tape to label the glass with the brand name of the detergent used. Set the glass aside at the far end of the garbage bag.
6. Rinse and wipe off the tablespoon.
7. Make the rest of the detergent solutions by using one tablespoon of detergent for each cup of water. Mix and label each solution, rinsing the tablespoon after each use. Remember, you must use exactly the same amount of detergent and water in each glass. This way, you are controlling those two variables.
8. It's important that you use the same amount of soap solution to blow each bubble. To make sure of this, mark the straw two inches from the bottom with a pen or by bending the straw at the two-inch point. You will be measuring and recording each bubble you make on the data sheet.



9. Dip the straw into the first detergent solution up to the two-inch mark.
10. Before removing the straw, cover the top with your thumb or finger. This will keep the detergent solution in the straw until you take your finger off the hole.
11. Move the straw over the garbage bag and release your finger from the hole, emptying the detergent solution onto the bag.
12. Swirl the bottom of the straw around in the detergent solution on the bag so that a soap film covers the bottom of the straw.
13. Keeping the end in the solution, blow gently into the straw at a constant speed.
14. Blow until a bubble forms and then pops. Be aware that occasionally when bubbles pop, soap can fly into your eyes and cause a minor irritation.
15. When your bubble pops, a ring of tiny soap bubbles is left. Measure the ring by placing the ruler across the widest part of the bubble ring. This measurement is the diameter of the bubble. Round off the measurement to the nearest whole number.
16. Record the diameter on the data sheet by following the numbers up the left side of the graph until you get to the number representing the width of the bubble. Draw a line across the column at the number and then color in the bar below the line.
17. Using a new straw for each detergent, blow and measure bubbles remembering to record each bubble measurement for each detergent.
18. After all solutions have been used and all bubble sizes have been recorded, compare the results. Which solution made the bubbles with the largest diameter?
19. After recording all the bubble diameters for the first trial, clean off the garbage bag and repeat the entire experiment four more times. By repeating the experiment you will see if your results are consistent and you will find out which solution is the best.
20. Which bubble solution produced the best bubble? Which produced the worst? Were the results consistent for each trial? If not, what does this tell you about the validity of the experiment? Which variables do you think you were able to control?

What's going on here?

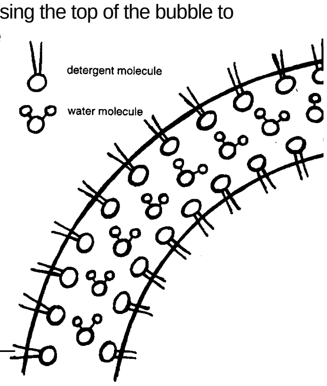
As you probably realize by now, one of the most important parts of any experiment is identifying each and every variable. In this particular test, you attempted to minimize the number of variables by mixing the solutions the same and testing the same amount; however, there were many hidden variables that you probably didn't even consider. When you think about it, it is virtually impossible to blow each bubble the exact same way each time. One time you may take a deeper breath and another time you may change the angle that the straw makes with the surface of the garbage bag. As a result, you have to consider a possible "blowing error" when you look at the final results. Setting up a true "fair test" is often a difficult, if not impossible task.

One way of minimizing the impact of these "hidden variables" is by using a larger sample. Scientists never base their results on only one test. They usually repeat the experiments several times and look for a consistent pattern in the results. If the results are not consistent, then they know that there are other variables that must be identified. In this particular experiment, you begin to develop a technique for blowing bubbles as you go along, so that in reality, you blow the bubbles pretty much the same way each time. Every once in a while though, you may change your technique slightly, which in turn affects the size of the bubble. Chances are you won't change your blowing technique five times in a row, so by testing each bubble solution five times, you reduce the chances of the "blowing error" giving you false results. The question is, how do you know how many times to repeat the experiment? Is five times enough? Why not 10, or 20 or even 100? The truth of the matter is, there is no real way of knowing how many trials are enough. The science of statistics uses a variety of different formulas to establish how many trials are "significant," but even then, there is a slight chance of error.

As for the science behind soap bubbles, anyone who has ever tried to blow a bubble in plain water knows that they don't form too well. That's because the force of attraction between water molecules is so great that it pulls the bubble in, crushing it before it gets a chance to form. This force of attraction is called surface tension. When you add detergent to the water, the detergent molecules are attracted to the water molecules and coat them so that they aren't in direct contact with other water molecules on all sides. As a result, the surface tension of the solution is lowered and the tendency for the bubble to get crushed is reduced.

Each soap molecule is formed by carbon and hydrogen atoms stuck together forming a tail and a sodium atom and a few oxygen atoms forming a head. The head is attracted to water, while the tail is not attracted. The way soap molecules line themselves up forms bubbles. When you blow air into the soap solution, all the heads instantly turn away from the air to try to stay in the water. At the same time, their tails are turning to get in the air. There are two sources of air for these heads and tails to turn toward and away from-the air at the surface and the air you're blowing in. So, two layers of soap molecules instantly line up, both trying their best to be in position. In doing so, they trap a thin layer of water between them (diagram 1).

Bubbles pop when there isn't enough water between the two layers of soap molecules to keep them apart. A good way to see this is to watch a bubble closely to see where it pops. Gravity makes most of the water drain from the top of the bubble toward the bottom, causing the top of the bubble to thin out and break. The detergent that causes the water to drain the slowest is the one that should produce the biggest bubbles.



This month in history

July

1057 — Chinese and Japanese astronomers note the supernova in the Crab Nebula

1776 — The U.S. colonies declare their independence from England

1898 — Theodore Roosevelt and his volunteer cavalry, the Rough Riders, storm San Juan Hill during the Spanish-American War

1940 — The first betatron goes into operation in Urbana, Ill.

1945 — ENIAC (Electronic Numerical Integrator and Calculator) runs the "Los Alamos Problem" related to thermonuclear weapons design

1955 — Disneyland opens in Southern California

1960 — A Polaris missile is first fired from a submerged submarine

1969 — U.S. astronauts Neil Armstrong and Edwin Aldrin make the first landing on the moon

1976 — The International Space Hall of Fame is dedicated at Alamogordo

1989 — The Manuel Lujan Jr. Neutron Scattering Center is dedicated at TA-53

1994 — Comet Shoemaker-Levy crashes into the planet Jupiter

1997 — The Laboratory conducts the Rebound subcritical experiment at the Nevada Test Site

Syndicated material

Removed at the request of the syndicate

Young inventor dreams of robots, special vehicles and a clothes machine

by Kay Roybal

What do a traffic signal, a harpoon, an ironing board, a lawn sprinkler and a Supersoaker water gun have in common? They all sprang from the imaginations of black inventors, only some of whom received patents for their work.

A recent presentation on black inventors given by Betty Harris of the Diversity (DV) Office during an Inventions Workshop for young local students made a powerful impact on a McCurdy School sixth grader, who has planned a career as an inventor since the fourth grade.

Marcus Grant, an 11-year-old from Española, displays his solar-powered elevator that he made at home out of a cardboard box, solar panels, ropes and pulleys. Grant, who has planned to be an inventor since the fourth grade, recent attended a presentation on black inventors given by Betty Harris of the Diversity (DV) Office during an Inventions Workshop for young local students. *Photo by LeRoy N. Sanchez*

"My dad always wanted me to be a scientist, but I started being interested in inventions after we studied Albert Einstein," said Marcus Grant of Española. "After that, I invented a clothes machine that's like a big cabinet with a round top with hangers that you control from a dashboard. You push a button, and it will show you what you have in your closet," he said. "You spin the clothes around and when you find what you want to wear, you push a button and this teeter-totter slides it down the chute."

Although the clothes machine is still a work in progress, Grant's ambitions were given a boost when his teacher signed her class up to participate in the Epsilon program, sponsored by the Lab's Education Program Office (STB-EPO). The Educational Pipeline for Student Initiatives Linked On the Network involves elementary students in a problem-solving course that culminates with the two-day Inventions Workshop at the Lab.

With the help of information gleaned on the Discovery Channel, the 11-year-old volunteered to build a solar-powered elevator. "I made it at home out of a cardboard box, with solar panels and ropes and pulleys," he said. "The first time I tried to make it work, the rope got tangled in the pulley, but I figured out how to put a straw in the works to keep the rope straight."

Harris' presentation on black inventors and patents, based on the Black Inventors Museum exhibit displayed at the Mesa Public Library in 1997, was a revelation for Grant.

"My mom had told me that a black person invented the traffic light," he said, "but I never knew that a black man invented the Supersoaker. I thought that was pretty cool."

Harris, a chemist who has worked at the Lab since 1970, was also a young science prodigy growing up in Louisiana. "I was very aware of patents and inventions," she said, "but I could never get a hold on why it seemed to be so easy back in the 1800s when everyone was patenting things. I guess the laws back then made it easier."

Not easy enough for black inventors like Lewis Temple and Henry Blair. Temple, who invented the harpoon, was never issued a patent. Blair, who invented corn and cotton planting machines, had to allow a white man to hold his patents. Garrett Morgan, who was issued a patent for his safety hood, a forerunner of the gas mask, was forced to pose as an Indian to demonstrate his invention, and some of his customers canceled their orders when they discovered he was black.

Grant is brimming with ideas for inventions he hopes to patent someday. "I'd like to design driving systems for handicapped people, and I'd like to design an all-terrain vehicle for them so they can go hiking and camping," he said. He also was fascinated by a robotics presentation at the Inventions Workshop, and robots figure prominently in his future plans.

"I'd like to invent a robot to clean up the house, so my mom and I can just play a board game or something while the robot's doing our chores," he said. "I'd also like to invent a robot that could get supplies in emergency rooms."

Harris is thrilled to have helped light a fire in a young mind. "That young man will be an inventor if nobody tells him he can't," she said.

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