

Earthquake researcher Paul Johnson sits next to an image showing photoelastic granules under stress in an “earthquake machine.” Stresses on the granules show up as brighter regions. When forces are applied to the granules, stresses

propagate through the granules, creating “force chains,” like the tracks visible in the image. Photo by Dixon Wolf, Records Management, Media Services, and Operations

## Earthquake ‘memory’ could spur aftershocks

by James E. Rickman

Using a novel device that simulates earthquakes in a laboratory setting, a Los Alamos researcher and his colleagues have shown that seismic waves—the sounds radiated from earthquakes—can induce earthquake aftershocks, often long after a quake has subsided.

The research provides insight into how earthquakes may be triggered and how they recur.

In a letter that appeared in *Nature*, Paul Johnson of Geophysics (EES-11) and colleagues show how wave energy can be stored in certain types of granular materials—like the type found along certain fault lines across the globe—and how this stored energy can suddenly be released as an earthquake when hit by relatively small seismic waves far beyond the traditional “aftershock zone” of a main quake.

Perhaps most surprising, researchers have found that the release of energy can occur minutes, hours, or even days after the sound waves pass. The cause of the delay remains a tantalizing mystery.

Earthquakes happen when Earth’s crust slips along cracks, known as faults. Major faults can be found at the junction of independently moving masses of crust and mantle, known as tectonic plates.

Each earthquake releases seismic waves—vibrations at the cusp, or below the range of human hearing—that travel through Earth. These waves can trigger aftershocks in a zone several to tens of miles away from the radiating main earthquake, known as a “mainshock.” Most aftershocks usually occur within hours to days after the mainshock.

Researchers often have assumed that seismic waves beyond the immediate aftershock zone were too weak to trigger aftershocks. However, Gomberg and others have proven that seismic activity sometimes increases at least thousands of miles away after an earthquake.

“At these farther distances, earthquake triggering doesn’t happen all the time,” said Johnson. “The question always was why? What was going on in certain regions that led to triggering? The challenge was whether we could go into the laboratory and mimic the conditions that go on inside the Earth and find out.”

The answer to the challenge lay at Pennsylvania State University, where Marone had developed an apparatus that mimics earthquakes by pressing plates atop a layer of tiny glass beads. When enough energy is applied to the plates, they slip, like tectonic plates above the mantle.

Johnson wondered whether sound waves could induce earthquakes in such a system. His colleagues originally believed sound would have no effect.

Much to their surprise, the earthquake machine revealed that when sound waves were applied for a short period just before the quake, they could induce smaller quakes, or, in some instances, delay the occurrence of the next major one. The sound waves seemed to affect earthquake behavior for as many as 10 earthquake events after they were applied.

More surprising still, the team found that the granular beads could store a “memory” even after the system had undergone a quake and the beads had rearranged themselves.

“The memory part is the most puzzling,” Johnson said, “because during an earthquake there is so much energy being released, and the event is so violent that you have to wonder, why doesn’t the system reset itself?”

The research has helped confirm that earthquakes are periodic events and that sound can disrupt them.

*continued on Page 3*

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NewsLetter

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## Use caution with microwave ovens

Recently, a Lab employee used a plastic coffee cup to reheat coffee in a microwave oven, left the area, and returned to find the microwave on fire. The



Photo courtesy of Industrial Hygiene and Safety Division

result was significant damage to the microwave and carpeting, and smoke damage to surrounding cubicles.

Though no injuries were sustained as a result of this incident in the Otowi Building, the Consumer Product Safety Commission reports that about 4,000 Americans incur injuries from microwaves every year with almost a third resulting in burns and scalds.

When using microwave ovens, ensure that containers are microwave safe, select the correct temperature and time settings, remain at the microwave until completion, and be careful removing the heated item.

One microwave-related phenomenon of note is superheated water, caused when water is heated past its boiling temperature. Such water does not appear to be boiling, though dust or an air bubble caused by movement or slight vibration can initiate boiling and cause eruption.

The Association of Home Appliance Manufacturers recommends allowing liquids to stand in the microwave for 30 seconds after heating.

For more information on microwave safety, see the United States Department of Agriculture Web site at [http://www.fsis.usda.gov/Fact\\_Sheets/Cooking\\_Safely\\_in\\_the\\_Microwave/index.asp](http://www.fsis.usda.gov/Fact_Sheets/Cooking_Safely_in_the_Microwave/index.asp) or the U.S. Food and Drug Administration Web site at <http://www.fda.gov/cdrh/consumer/microwave.html>.

## Anastasio tells employees no involuntary staff reductions

No Laboratory employees will be asked to involuntarily leave their jobs as part of Los Alamos's workforce restructuring effort, Director Michael Anastasio said, drawing applause at an all-employee meeting in the National Security Sciences Building.

The 430 employees who self-selected to leave Los Alamos, coupled with 140 additional employees who left the Lab since last September will preclude an involuntary reduction of personnel, explained Anastasio. He thanked employees who self-selected—their last day of work was January 10—saying those employees have been “integral to the Laboratory. Your tireless effort provided many contributions to the Laboratory over the years.”

The director also updated employees on the Lab's 2008 fiscal year budget and the National Nuclear Security Administration's assessment of the Lab's performance in the last fiscal year, including improvements it expects of the Lab going forward, especially in areas such as cybersecurity, project management, and safety.

“This has been a challenging year but also one of many successes,” said Anastasio. “We have an exciting future in front of us where we'll be evolving to meet the needs of the country.”

To read a summary of the talk, go to [http://int.lanl.gov/memos/2008/01/LANL\\_ALL2194.PDF](http://int.lanl.gov/memos/2008/01/LANL_ALL2194.PDF) online.



Photo by LeRoy N. Sanchez, Records Management, Media Services, and Operations

## New employee publication debuts in February

Starting in February, the Los Alamos Newsletter will be replaced with a new monthly publication, *Currents*.

Together with the electronic *Daily NewsBulletin*, the *Los Alamos NewsLetter* for seven years has provided employees with a smorgasbord of information to help keep them up to date. But all things come to an end, and this will be the newsletter's last issue.

*Currents* will continue to highlight the Laboratory's successes and challenges but with a focus on the people behind them. People are what make this Laboratory great, and it is the people and their research, achievements, and opinions that will take center stage in *Currents*.

The *Daily NewsBulletin* and *Links*, the Lab's e-mail communications tool distributed each morning, will continue to be the primary sources for news and breaking announcements.

*Currents* will be distributed through interoffice mail to all employees; retirees who now receive the newsletter also will get it.

The editorial staff remains the same and is excited to launch the new publication.

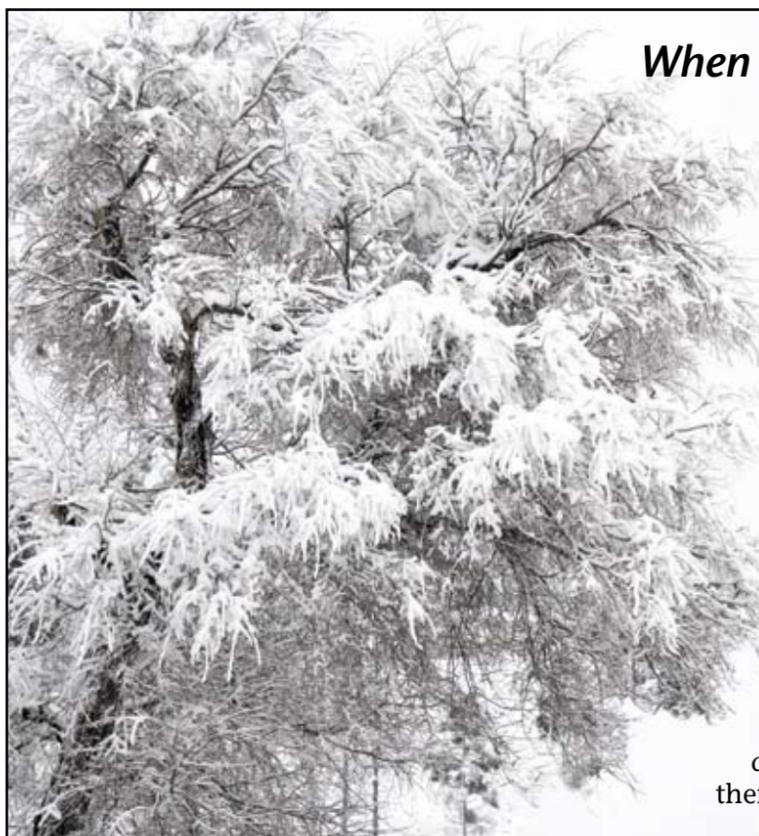
Look for *Currents* in early February.

## When it's snowing outside

In the event of inclement weather, Laboratory workers should call the Laboratory's UPDATE phone line at 667-6622 or toll free at 1-877-723-4101 for information about the Lab's operating status.

The UPDATE phone line is the Lab's official, primary source for obtaining such information.

The entire process for determining a delayed opening or Lab closure usually is completed by 5 a.m., and the Lab's operating status is available on UPDATE shortly thereafter.



## Los Alamos National Laboratory NewsLetter

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Los Alamos National Laboratory is a multidisciplinary research institution engaged in strategic science on behalf of national security. The Laboratory is operated by a team composed of Bechtel National, the University of California, Babcock & Wilcox Technical Services Group Inc., and Washington Group International for the Department of Energy's National Nuclear Security Administration.

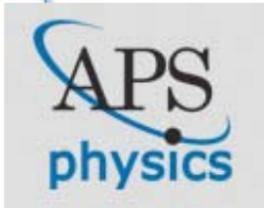
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## Three named to APS executive committee



**D**avid Moore and Dana Dattelbaum of Shock and Detonation Physics (DE-9) and Eric Brown of Weapons Physics (ADWP) have been elected to the Executive Committee of the American Physical Society's Topical Group on Shock Compression of Condensed Matter.

Moore will serve three years as vice-chair, chair elect and chair. Dattelbaum and Brown will serve two-year terms as executive committee members at large.

The topical group promotes the development and exchange of information in the discipline of shock compression science. The group provides its members and the American Physical Society an opportunity to distribute information on shock compression research.

The topical group organizes the APS Topical Conference on Shock Compression of Condensed Matter. The proceedings are published through the American Institute of Physics. The next conference is in Nashville, Tennessee, during the summer of 2009.

The topical group also presents a

prestigious APS award, the George E. Duvall Shock Compression Science Award.

The topical groups play a vital role in the American Physical Society, aiding the Society in fulfilling its mission to "advance and diffuse the knowledge of physics."



John Tapia

## Tapia heads to France to support ITER project

**J**ohn Tapia is on a one-year assignment in Cadarache, France, to support implementation of a risk-management system at the

International Thermonuclear Experimental Reactor project currently under construction. Before his appointment, he served as project manager for the Los Alamos Neutron Scattering Center Refurbishment Project in (ASM-PM).

ITER is an international research project designed to demonstrate the scientific and technological feasibility of fusion energy



**Q:** As part of the proposed nuclear weapons complex transformation, the National Nuclear Security Administration recently announced that the Laboratory is the preferred alternative site for plutonium research, development, and manufacturing; nuclear weapons design and engineering; and supercomputing. What do you think this means for the future of the Laboratory, and do you think this selection confirms that the Laboratory is first and foremost a science R&D Laboratory?



Doug Coombs of Scientific Software Engineering (HRC-1)

I think this bodes well for the future of the Lab. It seems to be in line with the mission of the Lab and in line with our projected and desired skill mix. It should enable us to attract scientific, engineering, and other technical talent that makes the Lab an attractive place to work.



Mike Henderson of Space Science and Applications (ISR-1)

It probably means that there will be less science done here at the Lab.



Ruben Gonzales of Departmental Computing 2 (CTN-2)

I think it's good that the NNSA recognizes the Lab's work in the area of nuclear research and has the confidence to continue relying on us as the complex changes. I feel confident that the future is bright for the Laboratory.



## January service anniversaries

**35 years**  
Gerald Streit, D-3

**30 years**  
James Barefield, C-ADI  
Jeffrey Hatchell, SB-PF  
Phil Kleinschmidt, PMPP-DO  
Tien Li, N-1  
Peter Lopez, WCM-2  
Raymond Martinez, MST-6  
Lorraine Montoya, IRM-RMMSO  
Consuelo Montoya, WES-RS  
Arthur Romero, W-3  
Douglas Tuggle, EO-EM  
E. Alan Wadlinger, HX-6

**25 years**  
Stephen Becker, X-2-AFS  
John Benage Jr., P-22  
Kathy Bull, HR-WEAPONS  
John Conwell Sr., IST-APPS3  
Charles McMillan, ADWP  
Comora Naranjo, WT-DO  
Mitchell Trkula, MST-DO  
Arthur Voter, T-12  
David Yeamans, PMT-1

**20 years**  
Lee Arellano, MSS-LFO  
Jeffrey Bloch, NN  
David Clark, ADSMS  
Fernando Garzon, MPA-11  
Bruce Lamartine, TT-DO  
Rick Martineau, X-2-PC  
Lori Mullen, WES-WA  
Dale Sanchez, CM-CMGRS  
Lawrence Ticknor, CCS-6

**15 years**  
John Benner, W-DO  
James Bland, RP-2  
Stephen Boerigter, PMPP-PPC  
George Erickson, IT

Robert Farris, EO-FP  
Loren Hatler, WT-1  
Robin Justice, CAO-IM  
Frank Krawczyk, ISR-6  
Monica Lucero, HPC-2  
Susan Martin, ESH-OFF  
Gordon Medford, W-3  
David Miko, N-1  
Lisa Mora, MSS-TA55FO  
Arthur Nobile Jr., AET-3  
David Schmidt, P-21  
Paul Schumann, ENV-RCRA  
Robert Tonelli, ASM-AO  
Rajendra Vaidya, AET-2  
Terri Villareal, ASM-SUB

**10 years**  
Catherine Agresto, LC-LM  
William Anderson, DE-9  
Sheldon Apgar, PMT-2  
Erica Baron, IAT-1  
Eve Bauer, MPA-MC  
John Collings, OM-MS  
David Crane, WT-2  
James Doyle, N-4  
Carlos Dozhier, PMT-5  
Moses Gallegos, CTN-1  
Steven Hare, HX-3  
George Hrbek, IHS-IP  
Ekkehard Koch, IST-APPS3  
Keith Lacy, PMT-3  
Annalisa Maestas, IRM-DCS  
Elizabeth Martinez, MSS-WFO  
Braxton Melton, CMRR-DO  
Richard O'Rear, WT-8  
Billy Pearl, SEC-DSS9  
Kenneth Schlindwein, FMO-DO  
William Smith, EES-2  
Leonard Trujillo, N-3  
Emilia Veale, WCM-3  
Beth Wingate, CCS-2

**5 years**  
John Archuleta, SAFE-S3  
Enrique Batista, T-12  
Kunegunda Belle, X-2-N1  
Lia Brodnax, C-IIAC

Dennis Ciocchetti, EWMO-TRU  
Sebastien Darteville, EES-11  
Anemarie Deyoung, P-23  
John Dunwoody, PMT-1  
Jennifer Duran, HPC-1  
Devon Engleman, MQ-2  
Terrence Forrester, ASM-SUB  
Katherine Frame, N-1  
Christina Galvez, LC-ELB  
Anna Giambra, DE-1  
Cynthia Heath, ISR-6  
Brian Key, D-6  
Pamela Koby, HR-SCIENG  
Cindy Lawton, IHS-IP  
Karen Lebron, ASM-AO  
Sandra Lewis, SAFE-MCAS4  
Conway Martinez, HR-SYS  
Drew Martinson, WT-DO  
Michelle Mas, FMO-DO  
William McConaghy, SEC-DSS9  
Nathan McDowell, EES-2  
Ryan Melcher, WT-1  
Wade Nelson, SEC-DSS9  
Rafael Padilla, W-2  
Feng Pan, D-6  
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Donald Werder, C-PCS

## Earthquake 'memory' ...

*continued from Page 1*

But catastrophic events in other granular media—such as avalanches or the sudden collapse of sand dunes—could help provide clues into the physics of earthquakes, and could help Johnson and his colleagues begin to unravel the mystery of stored memory in granular systems.

"What we've created in the laboratory has provided the basis for an understanding of dynamic triggering of earthquakes, something that has mystified people for years," said Johnson.

Johnson's colleagues involved in the research are Heather Savage of Penn State University and the University of California, Santa Cruz; Mike Knuth of Penn State and the University of Wisconsin; Joan Gomberg of the United States Geological Survey and University of Washington; and Chris Marone of Penn State.

Johnson's work was supported by the Department of Energy's Office of Science, Office of Basic Energy Sciences.



# Two careers in service to the nation

by Nancy Ambrosiano

**D**oug Anson is a senior military adviser to the Lab's Threat Reduction Defense and Intelligence program office. He also is a newly promoted brigadier general in the United States Army Reserves and the Commanding General of the 3rd Brigade, 75th Division, based in Fort Sheridan, Illinois.

In addition to his threat reduction and military service, Anson has served as group leader of the former Military Systems Analysis and Simulations and deputy group leader of Simulation Science and Information Sciences.

Anson was awarded his new rank in a ceremony last month at Fort Sheridan, accompanied by his wife, Mija, and sons Byron and Davis, as well as family from across the country and well wishers from the Laboratory.

Discussing the challenge of maintaining two careers, thousands of miles apart, Anson said, "This country is at war. As someone who wears the uniform and has been trained as a soldier since my college days, I feel a responsibility to answer the call to war. I also share the values of the military institution and enjoy leading soldiers.

"Service as a soldier is service to something greater than myself—to the nation and what our great country stands for," Anson said. "We may debate among ourselves about politics and policies, but I am fiercely protective of our right to debate and protective of those values that we all share in the [United States of America]."

Anson acknowledges that he couldn't tackle the many responsibilities without an entire support network. With between 10 and 50 percent of his time spent on military duties, almost every evening is spent on the computer, BlackBerry, and phone communicating with his soldiers, peers, and leaders on military issues. "There's a saying about a three-legged stool, balancing work, family and the Reserve. My wife says I don't have it as balanced as I think I do, but my wife's been great. I couldn't do this without her support."

Anson also notes, "I'm grateful to the Lab and [Los Alamos National Security, LLC] for allowing me to do this. I've spent four years away since 9/11, and even now that I'm officially back, I'm only here half the time."

There's a strong benefit to the Laboratory in his bifurcated lifestyle, however, in that Anson brings almost unparalleled experience, insights, and access to the needs of the Department of Defense world. "I'm assisting with DoD program development, particularly in the special operations area, and I advise the Defense and Intelligence Program Director [Harald Dogliani] on military matters in general," said Anson.

"Doug's background and access to DoD makes him uniquely qualified to connect the Lab's multidisciplinary approach to the most pressing needs of the department," said Michael Burns, deputy associate director for threat reduction.

Originally from Long Island, New York, Anson is a graduate of the United States Military Academy with a bachelor's degree in general engineering and master's degrees



**Doug Anson, right, of Information Sciences is promoted to the rank of Brigadier General in the United States Army Reserves during a ceremony in December at Fort Sheridan, Illinois. Anson was accompanied by his wife, Mija, and sons Byron and Davis.** Photo courtesy of Anson

in operations research and industrial engineering from Stanford University.

He served 13 years in the regular Army and 15 years in the U.S. Army Reserves. He serviced in Korea, was an assistant professor at West Point, a research and development officer and engineering manager at Redstone Arsenal, Alabama, special assistant to the commanding general of the Joint Special Operations Command at Fort Bragg, North Carolina, and commander of the Simulation Exercise Group at Denver, Colorado, among many other posts. He also served in both Iraq and Afghanistan.

His military decorations include the Bronze Star, Defense and Army Meritorious Service medals, Joint and Army Commendation medals, Joint and Army Achievement medals, and Iraq and Afghanistan service medals.

"I currently am responsible for 470 soldiers and civilians—officers, noncommissioned officers, government civilians, and contractors," Anson said. "I also am responsible for training the commanders and their staffs of Army reserve units on battle command processes and systems prior to their deployments in support of operations Iraqi and Enduring Freedom. These commanders and staffs will lead about 10,000 men and women to Iraq, Afghanistan and Kosovo."

As a general officer, Anson also must perform special duties, as required, that include sitting on officer promotion boards and officiating at funerals for soldiers killed in combat.

"In general, the most rewarding aspect of being a military leader is taking care of soldiers," Anson said. "The young men and women in our army are amazing. The sacrifices they make and courage they display are awesome. It is a privilege and heavy responsibility ensuring they are trained, cared for, and led by example."

*'Service as a soldier is service to something greater than myself—to the nation and what our great country stands for.'*