



# Newsletter

College of Physical and Mathematical Sciences

February 2005

## In the month of February:

- February 15—Forum:  
Roger Porter, Harvard University
- February 21—President's Day
- February 22—Monday classes

## In this issue:

Y. professor warned of temblor in 1997 **1**

Partnership helps students improve science teaching **2**

NSF Grant **3**

Publications **3**

## Y. professor warned of temblor in 1997

*But Indonesia failed to heed him; Utah isn't listening either, he says*

Copyright 2005 Deseret Morning News

By Tad Walch

Deseret Morning News

Brigham Young University geology professor Ron Harris has had trouble sleeping since the earthquake he predicted seven years ago killed an estimated 150,000 people along the rim of the Indian Ocean on Dec. 26.

Research by Harris indicated an earthquake with a magnitude of at least 8.0 was due in the ocean west of Sumatra and would cause a devastating tsunami. He published the research in an Indonesian journal and pleaded with the government there to prepare, but little was done.

"It might not have made any difference," Harris said of the advice he gave, "but 100,000 people is a lot of people, and I feel connected to it in a way that's hard to explain."

He's also living close to another potential tragedy, the magnitude 7.0 earthquake he and other researchers at BYU and the University of Utah expect could strike at any time along the Wasatch Front.

Harris fears Utah suffers from a lack of preparation similar to Indonesia's.

"We've been talking about the earthquake hazards here for a long time and most people still have their heads in the sand," he said.

The renovations to the Utah State Capitol and the Salt Lake Tabernacle are welcome signs, he said, but hundreds of thousands of Utahns are at risk living and working in buildings that aren't reinforced while strain builds along the Wasatch fault, according to work originated by Bob Smith at the U.

Smith, Harris and students at both universities have measured the accumulating strain on the fault that runs between the Salt Lake Temple and the state Capitol and down through Utah County as the western United States moves farther west away from the Wasatch Mountains.

"We know it's not dead," Harris said of the fault. "We know it's still alive. Eventually, whatever's holding it together will snap."

A very different kind of fault caused the Indian Ocean tsunami.

Instead of it pulling apart, Harris and his former student at West Virginia University, Carlos Prasetyadi, measured the rates that tectonic plates were colliding beneath the ocean floor off Sumatra.

The area, known as the Sunda subduction (or collision) zone, is known for major earthquakes that occur when the energy built up by the plates pressing against each other is finally released.

The longer the plates are stuck and energy accumulates from opposite directions, the larger the earthquake will be.

"The entire 1,600-kilometer length of the Sumatra fault system has not slipped significantly for 130-150 years," Harris wrote in an updated version of his report for a BYU publication in 2002. "Since this time, seven to eight

See *TEMBLOR* on Page 2

# Temblor

*continued from Page 1*

meters of potential slip have accumulated and will most likely be released suddenly to produce a magnitude 8.0-plus event.”

The area could soon experience another disaster. As he did in 1997 and again in 2002, Harris still predicts a similar-size earthquake on the eastern side of Indonesia in the Timor region.

He will try again to persuade governments in the area to take his advice to reinforce buildings and use palm trees to reinforce beachfronts.

“We were trying to encourage the (Indonesian) government to erect barriers of closely spaced palm trees along the shorelines of Sumatra and Java,” Harris said.

Palm trees are ubiquitous in the region, and what Harris calls a “tsunami net” could have been put in place with almost no expense to local villages.

The lines of trees would take a lot of energy out of an incoming tsunami, mitigating damage to buildings, and also act as a net when the water rushes back to the ocean.

“Most people died as they were pulled back to the ocean,” Harris said. “The trees can give people something to grab onto.

News articles last week supported that notion, describing survivors wedged in trees along the shores.

The earthquake six miles under the Indian Ocean seabed launched a tsunami that raced away from the site at 500 mph and created tidal waves as tall as 20 feet.

The devastation stretched to 12 countries from Indonesia all the way to the eastern African coast and north to India, where a government official called the tragedy an “extraordinary calamity of . . . colossal proportions.”

Harris, whose research continues at BYU with a \$120,000 grant from the National Science Foundation, is certain his suggestions would have made a difference.

“I’m sure the death toll would have been reduced significantly,” he said. “We’re hoping the Indonesian government will be a little bit more likely to listen to us now when we say, just plant some more palm trees on the beachfront.”

He openly wondered during an interview Monday if he shouldn’t have issued his warnings village to village in Indonesia instead of futilely restricting his attempts to official government channels.

Utahns should heed warnings from scientists, as well, he added, because preparation is the only defense.

“Earthquakes are the ultimate terrorists,” Harris said. “They can flatten entire cities and the entire coastline of a country, but we know where they’re going to strike. We just don’t know when.

“People have to think like it’s going to happen tomorrow instead of just wishing it won’t, like those Indonesians did, and coming to regret it.”

## Partnership helps students improve science teaching

**The Daily Universe, January 25, 2005**

**By Bethany Hyatt**

Future teachers will have the chance to sharpen their science-teaching skills this March thanks to a partnership developed last November with Joaquin Elementary.

Students in [assistant] professor of geology Barry Bickmore’s class had the opportunity to share their passion of science with students at Joaquin Elementary by presenting mini-lessons of earth science concepts.

“The [elementary] students were able to see that science is fun, not just drudgery and boring,” said Don Dowdle, principle of Joaquin Elementary. “The presentations whet their appetite to learn more.”

BYU students set up 15 to 20 booths around Joaquin Elementary’s gymnasium and presented five-minute presentations for each concept over the course of one hour.

Dowdle said he hopes to extend the program to two hours, so that students will have a chance to see all of the booths and have more time to enjoy the presentations.

The earth-related lessons were selected from the Utah State Core Curriculum for grades 1 through 6.

One of the objectives for the teaching partnership is to increase the elementary student’s scores on the state’s year-end standardized

tests in May. After the test results are analyzed, Dowdle will determine if the objectives were achieved.

The mini-lesson also increased the BYU physical science students’ desires to teach. For many students, it was their first opportunity to be in a teacher-student setting.

See *PARTNERSHIP* on Page 3

## NSF Grant

The National Science Foundation has awarded Math a grant of \$158,166 over three years for support of a Research Experiences for Undergraduates site at BYU in mathematics. This grant will allow Math to expand the BYU Summer Mathematics Institute into a fully-funded eight week summer REU program. The director of the site is Michael Dorff, and the co-PI's are Gary Lawlor, Denise Halverson, and Scott Glasgow. The topics for the program will include area-minimization, minimal surfaces, and mathematical physics.

## Partnership

*continued from Page 2*

Many of Bickmore's students are only a semester removed from high school and look forward to teaching as their profession.

"They seemed to have an epiphany," Bickmore said. "They realized how difficult it is to effectively teach children the principles."

Future teacher Jessica Rex, 18, a freshman from Alpharetta, GA, majoring in elementary education, is excited about the experience and knowledge the course provides.

"I want to be able to explain why things happen—such as the tsunami in Asia—to children in my classroom and at home," Rex said.

## College Publications

### Chemistry and Biochemistry

Z. Janeba, X. Lin, and M.J. Robins, "Functionalization of Guanosine and 2'-Deoxyguanosine at C6: A Modified Appel Process and SNAr Displacement of Imidazole," *Nucleosides, Nucleotides & Nucleic Acids*, 23(1), 137-147 (2004).

M.F. Vickers, J. Zhang, F. Visser, T. Tackaberry, M.J. Robins, L.P.C. Nielsen, I. Nowak, S.A. Baldwin, J.D. Young and C.E. Cass, "Uridine Recognition Motifs of Human Equilibrative Nucleoside Transporters 1 and 2 Produced in *Saccharomyces cerevisiae*," *Nucleosides, Nucleotides & Nucleic Acids*, 23(1), 361-373 (2004).

J. Liu, Z. Janeba and M.J. Robins, "SNAr Iodination of 6-Chloropurine Nucleosides: Aromatic Finkelstein Reactions at Temperatures Below -40°C," *Org. Lett.*, 6(17), 2917-2919 (2004).

J. Liu and M.J. Robins, "Azoles as Suzuki Cross-Coupling Leaving Groups: Syntheses of 6-Arylpurine 2'-Deoxynucleosides and Nucleosides from 6-(Imidazol-1-yl)- and 6-(1,2,4-Triazol-4-yl)purine Derivatives," *Org. Lett.*, 6(19), 3421-3423 (2004).

I. Nowak, J.F. Cannon and M.J. Robins, "Synthesis and Properties of gem-(Difluorocyclopropyl)amine Derivatives of Bicyclo[n.1.0]alkanes," *Org. Lett.*, 6(25), 4767-4770 (2004).

S. Mettath, G.S.C. Srikanth, B.S. Dangerfield and S.L. Castle, "Asymmetric Synthesis of  $\beta$ -Hydroxy Amino Acids via Aldol Reactions Catalyzed by Chiral Ammonium Salts," *J. Org. Chem.*, 69(19), 6489-6492 (2004).

M.B. Andrus, "Polyene Multi-Drug Resistance Reversal Agents," *Current Opinion in Drug Discovery & Development*, 7(6), 823-831 (2004).

S.A. Fleming, "Photocycloaddition of Alkenes to Excited Alkenes,"

chapter in *Synthetic Organic Photochemistry*, A.G. Griesbeck and J. Mattay, eds., Marcel Dekker, New York, 2004, 141-160.

L. Wang, K. Vu, A. Navrotsky, R. Stevens, B.F. Woodfield, and J.B. Goates, "Calorimetric Study: Surface Energetics and the Magnetic Transition in Nanocrystalline CoO," *Chem. Mater.* 16 5394-5400 (2004).

D.J. Henderson, D.T. Wasan, and A. Trokhymchuk, "Effective Interaction Between Two Giant Spheres Suspended in a Size Polydisperse Hard-Sphere Fluid," *Mol. Phys.* 102, 2081-2090 (2004).

### Mathematics

Graham F. Carey, William Barth, Juliette A. Woods, Benjamin S. Kirk, Michael L. Anderson, Sum Chow, and Wolfgang Bangerth, "Modeling error and constitutive relations in simulation of flow transport," *International Journal for Numerical Methods in Fluids*, 46:12, 1211-1236 (2004).

S-S. Chow and G. F. Carey, "Numerical approximation of generalized Newtonian fluids using Powell-Sabin-Heindel elements: I. Theoretical estimates," *International Journal for Numerical Methods in Fluids*, 41:10, 1085-1118 (2004).

Sum Chow, Graham F. Carey and Michael L. Anderson, "Finite element approximations of a glaciology problem," *EDP Sciences, SIAM* 2004, 38, 5, 741-756 (2004).

### Physics and Astronomy

J. B. Peatross, J. R. Miller, K. R. Smith, S. W. Rhynard, and B. W. Pratt, "Phase matching of high harmonic generation in helium -and neon-filled gas cells," *J. Mod. Optics*, 2675-2683 (2004).

C. J. Howard and H. T. Stokes, "Structures and Phase Transitions in

Perovskites - a Group-Theoretical Approach," *Acta Cryst, A* , 93-111 (2005).

C. J. Howard and H. T. Stokes, "Octahedral Tilting in Cation-Ordered Perovskites - a Group-Theoretical Analysis," *Acta Cryst, B*, 674-684 (2004).

Jenni Christensen Currit and Steven E. Jones, "Solar Cookers for Developing Countries," published in the Solar Cooking Archives, available at: <http://solarcooking.org/Solar-Ovens-for-Developing-Countries.htm>

Jenni Christensen Currit and Steven E. Jones, "Introduction to Solar Cooking (CARES Program)," published in the Solar Cooking Archives, available at: <http://solarcooking.org/Solar-Ovens-for-Developing-Countries.htm>

Jorj I. Owen, Travis L. Niederhauser, Brent A. Wacaser, Marc P. Christenson, Robert C. Davis, Matthew R. Linford, "Automated, controlled deposition of nanoparticles on polyelectrolyte-coated silicon from chemomechanically patterned droplet arrays," *Lab. Chip.*, 4, 553 - 557 (2004).

## Statistics

Crane, D. R., Wood, N. D., Law, D. D., and Schaalje, G. B., "The relationship between therapist characteristics and decreased medical utilization: an exploratory study," *Contemporary Family Therapy*, 26:61-69 (2004).

Carmen, J.C., Nelson, J.L., Beckstead, B.L., Runyan, C.M., Robison, R.A., Schaalje, G.B., and Pitt, W.G., "Ultrasonically enhanced vancomycin activity against staphylococcus epidermidis biofilms In Vivo," *Journal of Biomaterials Applications*, 18:237-245 (2004).

Carmen, J.C., Nelson, J.L., Beckstead, B.L., Runyan, C.M., Robison, R.A., Schaalje, G.B., and Pitt, W.G., "Ultrasonic-Enhanced Gentamicin Transport through Colony Biofilms of *Pseudomonas aeruginosa* and *Escherichia coli*," *Journal of Infection and Chemotherapy* 10:193-199 (2004).

Robinson, T.F., Roeder, B.L., Schaalje, G.B., Hammer, J.D., Burton, S. and Christensen, M., "Nitrogen balance and blood metabolites of alpaca (*Lama pacos*) fed three forages of different protein content," *Small Ruminant Research*, 49:(in press).