RANDOM SAMPLES

edited by CONSTANCE HOLDEN

Science Education: Another Global Study

U.S. students will soon get a chance to show whether more than a decade of reform efforts has improved their performance in science and math. Next year will see the launching of TIMSS, the Third International Math and Science Study.* The study, the biggest ever, will include assessments of teaching methods and educational systems as well as comparisons of half a million students from 50 countries.

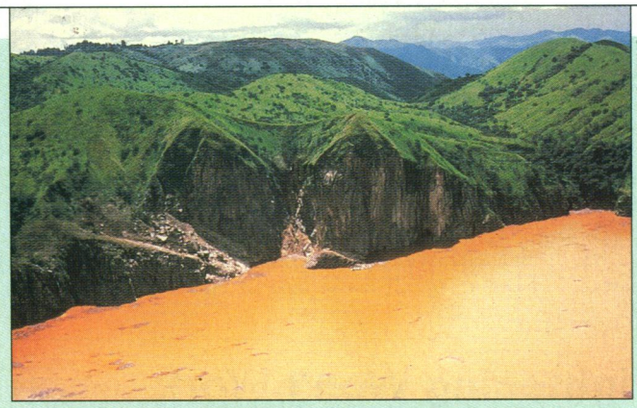
The first two TIMSS were in the 1960s and '70s, then the Educational Testing Service moved in with its International Assessments of Educational Progress (IAEP). Those are the two surveys that produced all those dreary reports about the backwardness of U.S. students during the 1980s.

TIMSS will not only cover more than twice as many countries as did the IAEP, but will include 12th graders as well as the 4th and 8th grade levels covered by IAEP. Furthermore, whereas the IAEP was based on U.S. tests, the TIMSS tests are designed by international committees "to represent a variety of curricula across the world," says coordinator Albert Beaton, an education professor at Boston College. Finally, TIMSS is addressing concerns regarding the comparability of different test-taking populations: The test-takers in each country must be representative of the school population—Israel, for example, will for the first time include Arabs.

The first round of testing starts next fall in the Southern Hemisphere, followed by the Northern Hemisphere in spring of next year. Results will come out in 1996. Not only the content but the "context" of learning will be probed in questionnaires for teachers, headmasters, and education ministries. And in three countries—the United States, Germany, and Japan—classes will be videotaped.

Finally, education professor William Schmidt of Michigan State University, who is running the U.S. operation, is doing an assessment of 1000 math and science textbooks from around the world, something "no one has ever done before." He says, "U.S. textbooks are really radically different from those of the rest of the world." Schmidt's not yet ready to expand on that, but here's a hint: He sees "no reason" to expect U.S. students to do any better in the TIMSS than they have before.

*TIMSS is sponsored by the International Association for the Evaluation of Educational Achievement (IEA) in The Hague. The U.S. portion is funded by the National Science Foundation and the Department of Education.



G. KLING

Muddy waters. Lake Nyos after 1986 gas outburst.

Killer Lakes Threaten to Strike Again

Two West African lakes that killed more than 1700 people in the 1980s when they belched forth lethal gas are building toward a new outburst at "an alarming rate." So say scientists who have been monitoring the lakes, warning that the next event could come in less than a decade—unless someone can be persuaded to fund their scheme to defuse the lakes.

What makes these lakes into killers is as simple as the fizz in a can of warm soda pop. In the aftermath of a 1986 disaster at Lake Nyos in Cameroon in which 1700 people were killed, limnologist George Kling of the University of Michigan and his colleagues concluded that a warm, mineral-laden spring somewhere on the lake's floor continuously pumps carbon dioxide gas into its bottom waters (*Science*, 30 June 1989, p. 1541). The disaster was triggered when some disturbance of the deep waters—a landslide or even a strong wind—reduced the pressure holding the gas layer down. That "popped the top," sending a stream of carbon dioxide—concentrated to toxic levels—gushing over the lake rim, smothering a nearby village.

Last month Kling told an audience at the Goddard Space Flight Center in Greenbelt, Maryland, that the recharging of Lake Nyos and Lake Monoun, which killed 37 people in 1984, is proceeding faster than expected. Nyos could let loose again in less than 30 years and Monoun in less than 10.

There is a simple way to avoid another disaster, he said: install a system that will continuously pipe deep, gas-laden waters to the surface. Kling and French colleagues have already demonstrated a small-scale version of the system at Monoun. They say both lakes could be fitted out with pipes for about $500,000, and they're looking around for international sources of funding.

Science on Tap

If you are bored with dial-a-pizza and telephone weather forecasts, here's a new variation: dial-a-scientist. United Kingdom residents can now—for the cost of a local telephone call—pick the brains of some of Britain's top scientific talent.

It's called "Science Line," and it started up on 21 March during Britain's first "science week," with funding from the Wellcome Trust, the Royal Society, and the U.K. government's Office of Science and Technology. The new service is already a hit—more than 400 calls came in over the first 3 days. Many of the questions deal with homely matters: Why, one caller asked, do soap bubbles always look white, regardless of the color of the soap? (Answer: They contain so little soap that the color is impossible to detect.)

Last week, the phones were manned by 16 scientists to cope with the initial deluge of calls. But once things settle down, says Science Line organizer Laurence Smaje of the Wellcome Center for Medical Science in London, the brain bank will be reduced to a four-person team, mostly drawn from science graduate students who will each pitch in for a few hours a week.

The core team should be able to answer around half of the queries on the spot, says Smaje. Callers with tough questions will be patched through to a medical information service run by the Wellcome Trust, or to staff at the museums of Science and Industry and Natural History in London. They may also be referred to one of about 300 researchers throughout the country who have offered to field queries in their specialties.

Smaje believes the service is unique. While a scientific question-and-answer service has operated in the Netherlands for the past 5 years, it is mainly targeted at schools. Science Line staff don't just want to help kids do their homework. Indeed, to reach the broadest possible public, Smaje plans regular tie-ins with television science documentaries, providing a way for viewers to get questions answered after a program.

* The Science Line can be reached Monday through Friday between 1:00 p.m. and 7:00 p.m. U.K. time, on 0345 600444.

Girding for Next Earthquake

Along with foundations and hillsides, the 17 January earthquake in Northridge, California, shook loose at least one new idea about how to recover from the next one. Farmers often buy retired flatcars at auction to bridge small creeks. But no one had connected them with natural disasters until engineer Bill Wattenburg came up with the notion that flatcars could be a cheap, strong, and fast emergency remedy for broken roads and collapsed bridges.

BILL WATTENBURG

Why didn't someone think of this? Retired flatcars make 4-lane bridge; cross braces are old boxcar beams.

Wattenburg, who is based at California State University, Chico, says he checked out his idea first with Berkeley engineer Abolhassan Astaneh, who has worked on Bay Bridge repairs following the 1989 Loma Prieta quake. He also ran computer simulations showing that a single span could bear up to 300 tons.

Now Caltrans, the state transportation agency, has sprung for the idea and MCM Construction Inc., in Sacramento, has built a prototype bridge for testing. "When this first started I thought Wattenburg was way out in left field," says MCM's president, James Carter.

Now it looks like he's hit a homerun. Wattenburg calls surplus flatcars "the most commonly available, inexpensive structural module in the world." Fitted together in multiple configurations like LEGO blocks, he says, they can be turned into roadways, ramps, and column footings. They can even make bridge columns: slice a flatcar down the middle and bolt the pieces together. MCM's prototype bridge is constructed from some 53' by 10 ½' flatcars, and Carter says it's currently holding up a load of 150 tons, with a deflection of only ⅜ inch. "For less than $100,000 we've got a bridge we can store at one of our maintenance yards and within a day you can set it up," says Caltrans chief engineer Jim Roberts. The scheme came too late to hasten recovery from the latest earthquake, but now Caltrans is steeled for the next one.

Wattenburg already has a reputation as Mr. Fixit. Recently, he persuaded the Pentagon to drop food to beleaguered Bosnians as small parcels rather than big parachuted bundles that can hit someone or fall in the wrong hands.

Reviving Old Mouse DNA

It's not as sexy as creating a dinosaur from DNA trapped in amber and Spielberg probably won't turn it into a flick—but University of North Carolina (UNC) researchers have "resurrected" a mouse gene that has not had any function for at least 5 million years. And the gene worked so well that it's a puzzle why it went extinct in the first place. The researchers believe this is the first time that ancient DNA has been reactivated.

This DNA didn't come from a fossil but from a living mouse. Like all mammals, mice carry genetic information that once provided a key function but ceased working long ago. Proceeding according to "maximum parsimony"—that is, assuming the slowest possible DNA mutation up to the present—Clyde Hutchison III, Marshall Edgell, and co-workers revived a nonactive promoter (an element that turns on a gene) by deducing what it looked like 5 million years ago and then changing every mutated base back to the original. The promoter came from a section of DNA called LINE-1 (L1), a large "transposable" element that can leap around the genome. Only one version of L1, subtype A, does that. The scientists zeroed in on a quiescent subtype, F—the oldest judging by how much it has mutated.

As the scientists reported in the 15 February *Proceedings of the National Academy of Sciences*, when they reconstructed the DNA of the ancient F-promoter and compared it to the modern A-promoter, they were surprised to find it was just as good at turning on a gene. However, the resurrected version seems to work by a different mechanism. It "appears to bind a completely different set of proteins than the modern promoter," says Hutchison. "The question now is why did the A-type acquire a new control mechanism?"

Molecular evolutionist Walter Fitch of the University of California, Irvine, is intrigued by the results because "you don't expect to get it right using maximum parsimony. The method is imperfect." Also, he is not sure that the F-type promoter really represents a novel type.

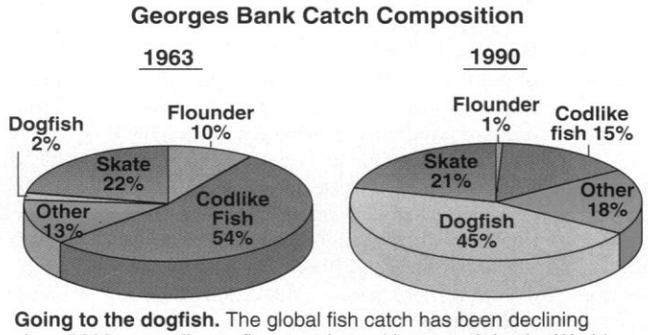
Meanwhile, the UNC team wants to develop an assay to enable them to find out if the ancient F-type can transpose in today's mice. And they hope to perform molecular resurrection in other systems, such as viruses or other ancient DNAs.

The Wait Goes On...

By the time the National Academy of Sciences gets around to issuing its long-awaited standards for science education, will the course of reform already be set? The academy's guidelines were supposed to emerge in draft form in January, but now they've been postponed until the summer.

The standards are to spell out what kids should learn in science from kindergarten through 12th grade. But although everyone agrees there should be more emphasis on concepts and less on rote learning, educators are still debating the details of what students should learn and when.

Meanwhile, states are moving ahead on their own. Sixteen states have grants from the Department of Education to put together their own standards, and in the absence of academy guidance some are turning elsewhere—such as to proposals published last fall by Project 2061 of the AAAS (the publisher of *Science*), and to guidelines from the National Science Teachers Association. The new chair of the academy's project, Richard D. Klausner of the National Institute of Child Health and Human Development, says, though, that draft copies should be ready by the time state teams gather for intense work sessions this summer.



Going to the dogfish. The global fish catch has been declining since 1989, according to figures released last month by the World Resources Institute (WRI). "Equally disturbing," says WRI, is that overfished species such as cod are losing ground to less savory types. This chart is from WRI's biennial report, World Resources, available for $23.95 plus $3 shipping from WRI Publications, P.O. Box 4852, Hampden Station, Baltimore, MD 21211.