3 millimeters and then shatters, leaving a cloud of tinier bubbles that quickly dissolve. On audio, the big bubble break, or cavitation, invariably broadcasts a loud snap. "What we hear must be bubble noise," says Schmitz. "The recordings are quite convincing."

To work out the physics of this crustacean cavitation, the researchers simulated it with a numerical model. Their model relies on a phenomenon called Bernoulli's Principle: When liquid moves above a certain speed, its pressure drops, and vapor bubbles in the liquid expand. But if the pressure rises again, those bubbles will implode. And that's precisely what happens with a snapping shrimp, Lohse says, as the water jet spewing from its claw returns to normal pressure. The team's calculations of bubble shape and speed closely mirror the lab recordings, Lohse adds.

"The study makes a nice case for cavitation," agrees physicist Michael Buckingham of the Scripps Institution of Oceanography in La Jolla, California. Buckingham wonders, however, whether suction pad–style membranes on the back of the shrimp's claw—and not the closing of the claw itself—cause the bubbles. For that matter, no one knows how many of the roughly 400 snapping shrimp species blow bubbles, or how the talent evolved. On these matters, the shrimp fall strangely silent. **–KATHRYN BROWN**

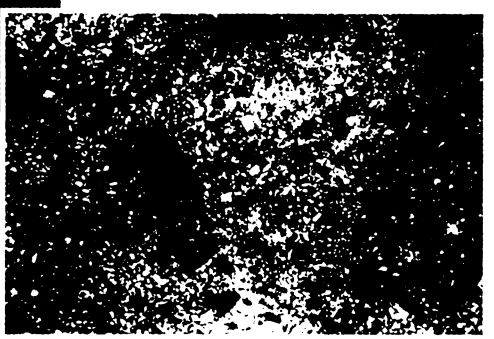
Kathryn Brown is a writer in Alexandria, Virginia.

ARCHAEOLOGY

A Victim of the Black Sea Flood Found

Have deep-sea explorers uncovered the drowned dwelling of some of Noah's less fortunate contemporaries? Archaeologists are mulling over tantalizing images of what appears to have been a house of wood and mud littered with human artifacts now 91 meters beneath the Black Sea. The find lends further credence to the claims of two oceanographers that a torrent equaling 200 Niagara Falls cascaded from the Mediterranean Sea 7500 years ago, driving Neolithic peoples living along the Black Sea coastline inland (*Science*, 20 February 1998, p. 1132). But whether the catastrophe gave rise to the biblical account of Noah's Flood and spread farming into central Europe, as the researchers speculate, we can't yet say.

Oceanographer Robert Ballard of the Institute for Exploration in Mystic, Connecticut, led the expedition during which the discovery was made. He used the same combination of underwater technology and informed searching as he employed when he made his other famous finds, including the *Titanic*, the *Bismarck*, and two Phoenician ships—the oldest shipwrecks ever discovered in deep water. Guiding a remotely operated vehicle across a sea-floor target initially identified in a sonar survey, Ballard and his colleagues on the National Geographic Society–sponsored expedition came upon



Flood detritus? A beveled log *(above)* and a likely stone tool *(right)* mark what appears to be a flooded home.

"one of the most astonishing things I've ever seen," said the expedition's chief archaeologist, Fredrik Hiebert of the University of Pennsylvania in Philadelphia, whose research centers on Neolithic sites onshore from the find off the Turkish south coast of the Black Sea.

In a shipboard interview provided by the society, Hiebert recounted what to date other archaeologists have seen in a few grainy images. "... We were coming along the flat, slightly sloping plane of the bottom of the Black Sea today. It was almost featureless. ... We found a rectangular site some 4 meters across and maybe double that in length. ... Here were hewn beams in a rectangular form along with branches that seemed to be stuck in layers of mud. What we were looking at was a melted building made out of wattle and daub. Now, this is the typical type of construction for the ancient inhabitants along the Black Sea coast. And here we're seeing it under 300 feet [91 meters] of water. ... As we went very carefully—practically inch by inch—over this site, we began to see stone tools. ... I don't know if they're hammers or chisels ... but it's quite clear that they were worked by human hands. ... We also found fragments of ceramics. ... This is a remarkable find."

Archaeologists who have seen the few images released on the nightly news or the society's Web site (www.nationalgeographic.com) are definitely intrigued. "There do seem to be some traces of human activity," says archaeologist Peter Bogucki of Princeton University. "Based on these photos, they have found highly suggestive evidence of human habitation," says archaeologist Andrew Moore of the Rochester Institute of Technology in New York. But like others, he adds, "I would like to see the objects themselves." Some, such as wood suitable for carbon-14 dating, may be retrieved on this expedition.

The presumed discovery would lend support to the scenario put forth 3 years ago by oceanographers William Ryan and Walter Pitman of Columbia University's Lamont-Doherty Earth Observatory in Palisades, New York, in which rising sea level in the Mediterranean after the last ice age eventually breached the Bosporus strait and expanded the existing freshwater lake by a kilometer or more a day. The geologic evidence has largely persuaded archaeologists of the reality of the deluge, says Moore, but "there is a great deal of skepticism of the larger claims of cultural change." The requisite coastal population may have been there at the time of the flood, says Moore, but the links to a forced migration that spread agriculture and prompted flood myths are "still tenuous ones for most scholars."

–RICHARD A. KERR

BROOKHAVEN LAB

Forbes Loses in Fallout From Reactor Fight

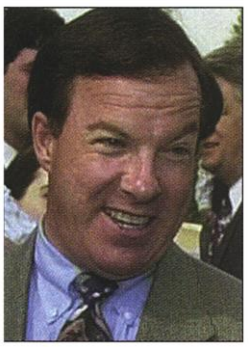
A New York congressman who sided with environmentalists to kill a nuclear research reactor at Brookhaven National Laboratory in Upton, New York, has been defeated in a stunning primary upset. Representative Michael Forbes, who switched from the Republican to the Democratic party last year, lost last week by a narrow margin to Regina Seltzer, the 71-year-old widow of a Brookhaven chemist. The defeat is a blow to the national Democratic party, which had strongly backed Forbes, but is welcome news to many Brookhaven scientists.

Forbes had alienated many of the lab's 3000 employees in recent years when he urged the Department of Energy (DOE) to shut permanently the High-Flux Beam Reactor, which leaked tritium (*Science*, 25 February, p. 1382). Although DOE chief Bill Richardson decided last year to close the facility, many scientists accused Forbes of politicizing the issue and currying favor with influential Long Island environmentalists. Seltzer,

CREDITS: INSTITUTE FOR EXPLORATION/NATIONAL GEOGRAPHIC SOCIETY

a former librarian, describes herself as "a passionate supporter of science."

Seltzer won the 12 September primary by just 35 votes, causing Long Island activists to point to the lab as a critical factor. "There was a lot of resentment toward Forbes," says Brookhaven chemist Joanna Fowler, who backed Seltzer. Adds one DOE official, "If he hadn't done what he did to Brookhaven, he would have won this election."



Strong reaction. New York Democrats ousted incumbent Michael Forbes.

Seltzer, who billed herself during the primary campaign as the "real Democrat," faces an uphill battle against Republican Felix Grucci Jr. because of the district's heavy Republican majority. Forbes will appear on the November ballot as the candidate of a minor party.

–ANDREW LAWLER

MEDICAL ETHICS

Moratorium Urged on Germ Line Gene Therapy

A report issued this week by the American Association for the Advancement of Science (AAAS, publisher of *Science*) has called for a total moratorium* on attempts to cure genetic diseases by altering the genome in ways that would be passed from one generation to the next. Human germ line gene therapy would be unsafe and unethical, the report concludes. And it urges the government to create an independent panel to monitor public and private research and prevent such risky experiments.

The authors of the report, ethicists Mark Frankel and Audrey Chapman of the AAAS staff in Washington, D.C., reached these conclusions after consulting for 2 years with a score of advisers in gene therapy, ethics, sociology, and theology. They found wide support for a moratorium on germ line gene therapy. But they went further, proposing a moratorium on therapies that might change human DNA accidentally, including methods already being used by some reproductive medicine clinics.

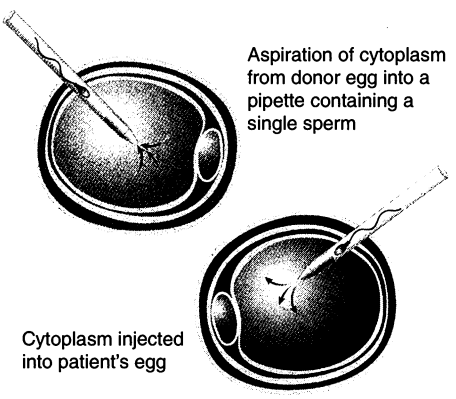
The DNA editing methods that make it possible to revise mammalian genomes are "developing impressively," said Theodore Friedmann, director of the gene therapy program at the University of California, San Diego, and adviser to the AAAS authors. It would be exciting to try to "fix" genetic diseases by editing the human genome, Friedmann said, but he is convinced that the risks—not just to the individuals immediately affected but to future generations—outweigh the potential benefits.

The AAAS report reflects this concern, although it supports expanded basic research in this field as well as clinical gene therapy for cells other than sperm and eggs. Public funding of germ line gene therapy "is not warranted," it concludes. And it urges careful monitoring of private labs, noting that private firms might try to sell genetic "enhancement" therapies to improve the beauty, brains, and brawn of children. The report proposes that a national group of experts and laypeople, open to the public and housed at an institution that does not fund biomedical research, be established to keep tabs on the field.

At present, no public or private labs are proposing to do germ line gene therapy. But reproductive medicine clinics are conducting experiments that might be affected if these recommendations were adopted. For example, the report questions a type of therapy that involves removing cytoplasmic material from a donor egg and injecting it into a recipient to improve the egg's viability. The process also transfers mitochondrial DNA, which means that a child born by this process may inherit mitochondrial DNA from both eggs. The AAAS report classifies this as a type of "inheritable genetic modification" and argues that it should not be done at present.

Jacques Cohen, director of the Institute of Reproductive Medicine and Science at the St. Barnabas Medical Center in Livingston, New Jersey, which developed and is using the technique, agrees that it is "highly experimental." But he argues that it is "an incredible stretch" to classify it as germ line gene therapy. He says he has found no harmful effects from the technique, which has enabled infertile women to give birth to healthy babies—15 at last count.

–ELIOT MARSHALL



Risky therapy? Ethicists question a fertility technique that transfers cytoplasm from one human egg to another.

CREDITS: (TOP TO BOTTOM) D. COOK/AP; C. CAIN

* "Human Inheritable Genetic Modifications: Assessing Scientific, Ethical, Religious, and Policy Issues," by Mark S. Frankel and Audrey R. Chapman, (www.aaas.org/spp/dspp/sfrl/germline/main.htm

PLANETARY SCIENCE

Twins for the Themis Asteroid Family

Many planets enjoy the company of a moon or two, but asteroids usually travel in solitude. Now a high-tech telescopic search has revealed that the asteroid Antiope is actually two bodies of similar size circling each other. It's not the first asteroid found to be a pair, but the uniquely twinned Antiope presents a severe problem: How could the continual banging about among asteroids create bodies of similar size in orbit about each other?

The first discovery of a satellite pair didn't give theoreticians such trouble. In 1994, the Galileo spacecraft found little 1.5-kilometer Dactyl orbiting 56-kilometer Ida, and the most obvious explanation was a large collision. Ida is a member of an asteroid "family" of large fragments traveling in much the same orbit about the sun, all of which must have formed when a collision shattered a much larger ancestral asteroid. Dactyl could be just a small relic of the same event that Ida happened to capture. The discovery in 1999 of 13-kilometer Petit-Prince circling 214-kilometer Eugenia proved more difficult to explain because Eugenia is the largest of its family; any candidate satellites among the debris would have been blasted out of its gravitational grasp.

Now, in a meeting abstract newly posted to the Web (www.aas.org/publications/baas/v32n3/dps2000/590.htm), astronomer William Merline of the Southwest Research Institute (SwRI) in Boulder, Colorado—the discoverer of Petit-Prince—and his colleagues report the discovery of two more asteroid pairs. Using adaptive optics that undo the atmosphere's blurring effects, they imaged a small companion of the asteroid Pulcova. More surprisingly, they also split the supposed 120-kilometer Antiope—a member of the Themis asteroid family—into two equal-size bodies separated by 170 kilometers. "I'm stunned and astonished," says planetary physicist Jay Melosh of the University of Arizona, Tucson. "It's not anything that was expected."

Theoreticians contacted by *Science* are at a loss to explain the twinning of Antiope. Planetary dynamicist William Bottke of SwRI, Boulder (who is not a co-discoverer), does hazard a guess. Many small collisions may have reduced an ancestral Antiope to a collection of rubble, he speculates. If so, a glancing blow by another asteroid might have spun Antiope like a top, causing it to fly apart into two equal-size rubble piles still orbiting about their center of mass. But a lot of computer modeling will be needed to support such speculation. As Melosh says, "We have a very interesting new puzzle in the solar system."

–RICHARD A. KERR