grid of electric coils generated magnetic fields. The scientists presented each hatchling with one of three fields found at critical points along their migratory route: near northern Florida, Portugal, and the southernmost edge of the North Atlantic gyre.

In each magnetic field tested, the turtles swam preferentially in the direction of their migratory path. When the tank simulated the magnetic field of the northeastern gyre, for instance, the turtles began swimming south—a direction that, in the Atlantic, would keep them on course and away from fatally cold water. "By recognizing and responding to these regional magnetic fields," Lohmann surmises, "hatchlings with no prior migratory experience can make their way across the Atlantic."

The same innate feat may help migratory birds and other travelers. "This suggests many animals may be programmed with orientation responses to specific magnetic fields," notes ornithologist Kenneth Able of the State University of New York, Albany. The new study also means that hatchling loggerheads may not need a mental map of their migration. Rather, they may coast along the gyre current, veering in certain directions as they encounter new magnetic fields. "The big question now," Able says, "is how do these inherited responses work in the brain?" Because all sea turtles are threatened or endangered, however, researchers can't study their brains to learn how they detect magnetic fields.

Another animal is helping answer such questions: the Zambian mole rat. Although not a migratory creature, the mole rat boasts its own directional prowess: It digs underground tunnels that stretch 200 meters or more and then builds a nest at the end. In previous lab studies, researchers reported that Zambian mole rats consistently position their nests in a southerly direction, changing nest locations in accordance with a shifting magnetic field.

In the new study, Němec, Stephan Marhold at J. W. Goethe University in Frankfurt, Germany, and their colleagues combined this nest-building test with an assay of the mole rat's brain. The team put 16 mole rats in one of three conditions: the natural geomagnetic field; a periodically changing field with shifting polarity; and a weak, shielded field. As controls, six additional mole rats were kept in the natural field, while two were placed in the weak, shielded field.

The experimental mole rats were given time to build nests in plastic arenas. The controls were kept in home cages with existing nests. Afterward, the scientists assayed the animals' brains for the c-Fos transcription factor, a marker of active neurons. Levels of c-Fos remained relatively low among mole rats within the shielded field and among control animals. But mole rats that built nests within active magnetic fields showed strong activity in a layer of a brain region called the superior colliculus. This part of the brain is a neural way station known to collect spatial cues and direct orienting behavior.

"This study makes wonderful sense," says neuroscientist John Phillips of Virginia Polytechnic Institute and State University in Blacksburg. Until now, Phillips adds, most researchers have been hunting for sensory receptors that detect magnetic fields rather than studying areas that are responsible for more complex processing. Walker says this study may help knit the neuroscience efforts together. "We're on the edge of a coherent story, from detector cell to behavioral response," Walker says. "If there is a general magnetic sense for vertebrates, we should be able to see common mechanisms." With such diverse species as turtles and mole rats offering insights, he adds, the nature of navigation may finally be within reach.

–KATHRYN BROWN

AGRICULTURAL RESEARCH

Tornado Rips Apart Maryland Center

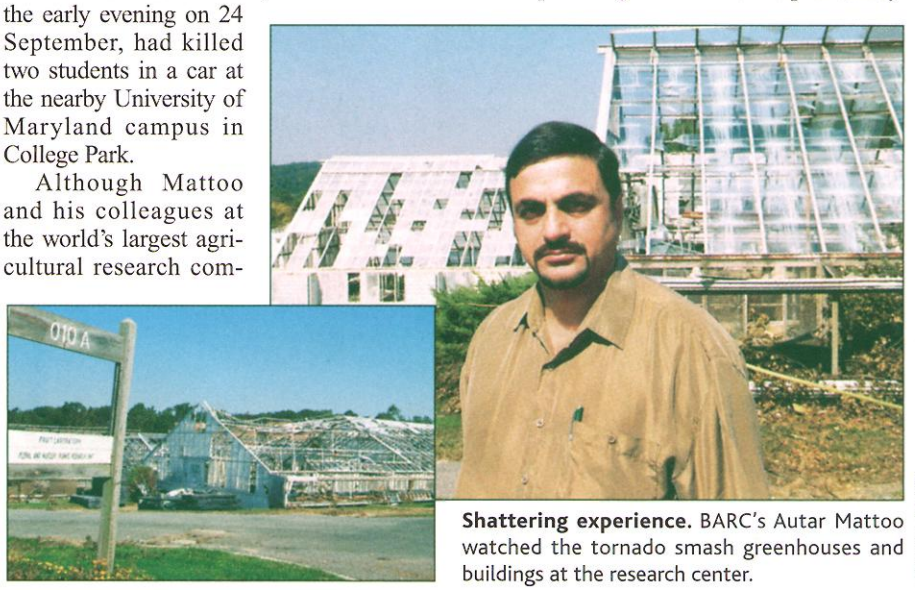
BELTSVILLE, MARYLAND—The funnel cloud was already teeming with glass shards, roof tiles, and tree branches when Autar Mattoo spotted it outside his window at the U.S. Department of Agriculture's Beltsville Agricultural Research Center (BARC) here. Seconds later it smashed windows in his research building and blew through the nearby cluster of greenhouses. "Shattered glass was everywhere. It looked like a war zone," recalls Mattoo, a molecular biologist. Moments earlier the tornado, which struck in the early evening on 24 September, had killed two students in a car at the nearby University of Maryland campus in College Park.

Although Mattoo and his colleagues at the world's largest agricultural research complex miraculously escaped the tornado's deadly force, their work setting was dealt a serious blow. BARC's director, Phyllis Johnson, estimates the destruction at $20 million, including extensive damage to one-third of BARC's 8400 square meters of greenhouses. In addition to plants damaged by the flying debris, high winds, and exposure to the elements, a power outage of nearly 48 hours may have ruined numerous frozen tissue samples and collections.

Reconstructing clones, says Robert E. Davis, who heads BARC's molecular plant pathology lab, could take 2 or 3 years. Many of BARC's research projects are done in conjunction with other labs around the world, he notes, meaning that the delays will have repercussions elsewhere. A week later, even getting around the workplace remained a challenge. "There's so much shattered glass, we had to wear hardhats when we went into the greenhouses," says plant pathology researcher Rosemarie Hammond, who is using plant viruses to produce vaccines for poultry and cattle.

At Mattoo's vegetable research laboratory—which uses biotechnology to complement classical breeding—transgenic tomatoes and potatoes in the greenhouses were toppled, cut by falling glass shards, and exposed to cool weather. Hundreds of tissue samples—collected over the years from transgenic plants—were ruined when the freezers shut off. "It's a great shame for our staff researchers and postdocs," he says. "In a matter of minutes, months of work was blown away."

Fortunately, the twister spared most of BARC's Animal and Natural Resources Institute and the Beltsville Human Nutrition Research Center. But it destroyed a $130,000 remote-sensing van that BARC scientists had borrowed from NASA's Goddard Space Flight Center for help in survey-



Shattering experience. BARC's Autar Mattoo watched the tornado smash greenhouses and buildings at the research center.

CREDITS: R. KOENIG

ing soil moisture and temperature from space. Although BARC has a small emergency fund, the money needed to recover from the tornado must come from Congress, now completing work on the agriculture department's 2002 budget. –ROBERT KOENIG

SCIENTIFIC PRIZES

Researchers Accept Not-So-Nobel Awards

BOSTON—While eminent scientists were heading to Sweden to accept their coveted awards (see p. 288), lesser known colleagues were celebrating a very different honor: the Ig Nobel Prize. For boldly tackling research topics such as why shower curtains billow inward, a select group from six countries and four continents was inducted into the scientific pantheon of ignominy at a raucous 4 October ceremony at Harvard University.

The Un Laurel. Harvard chemist and Nobelist Dudley Herschbach displays an Ig Nobel Prize before awarding it at last week's ceremony.

CREDIT: JON CHASE/HARVARD UNIVERSITY NEWS OFFICE

Four genuine Nobel laureates were on hand to present the awards—in the form of a plaque framed by a cell phone and two cans connected by string. The 11th annual send-up of the more staid Stockholm event featured a brief opera as well as what organizer Marc Abrahams described as "the world's most scientific wedding ceremony." Senior researchers also were invited to describe their field in 24 seconds and then in seven words. For her discipline, Smith College professor Dany Adams summarized: "If it can get infected, it's biology." Among the so-called winners:

Medicine. Peter Barss of Montreal's McGill University for his report on injuries due to falling coconuts. Barss explained that his Papua New Guinea research concluded that the worst injuries occur to individuals asleep beneath coconut trees.

Physics. David Schmidt of the University of Massachusetts, Amherst, for his work on why shower curtains billow inward. He told the audience that the value of such research, for which he received no outside support, lies in its immediacy to anyone who showers.

Biology. Inventor Buck Weimer of Pueblo, Colorado, for Under-Ease, airtight underwear that includes a replaceable charcoal filter to remove gases. He presented samples to the wedding couple and the Nobel laureates.

Economics. Joel Slemrod of the University of Michigan Business School in Ann Arbor and Wojciech Kopczuk of the University of British Columbia in Vancouver, for their research on the way estate taxes influence a person's time of death. Their work, said Slemrod, proves that "the pursuit of science, even social science, can be fun."

Psychology. Lawrence Sherman of Miami University of Ohio for his ecological study of glee in small groups of preschool children. Sherman noted that the paper published in *Child Development* in 1975 has garnered 120 citations. "And it's better to be used than not used at all," he added.

Astrophysics. MIT physicist Walter Lewin accepted the award on behalf of Michigan evangelists Jack and Rexella Van Impe, for their discovery that black holes fit all the technical characteristics of hell. Lewin demurred, however, noting that for astrophysicists, "black holes are heaven."

Technology. John Keogh of Hawthorn, Australia, for his successful patenting of the wheel in that country earlier this year. By audiotape, Keogh explained that he wanted to expose the absurdity of Australia's patent system; his patent indeed won worldwide attention.

The event, presided over by the king and queen of Swedish meatballs, included a win-a-date-with-a-Nobelist contest; the lucky winner gets to go out with Harvard chemist Dudley Herschbach, described as enjoying "collision theory and football." The ceremony concluded with the 60-second no-nonsense wedding of Lisa Danielson and Will Stefanov, two geologists from Arizona State University in Tempe. Abrahams, who edits the *Annals of Improbable Research*, then thanked participants, noting that "if you didn't win an Ig Nobel prize tonight—and especially if you did—better luck next year." –ANDREW LAWLER

ScienceScope

Science Posts The White House is said to be close to naming nominees for top posts at two federal science agencies. Veterinarian and pharmacologist Lester Crawford is rumored to be in line to head the Food and Drug Administration (FDA). Crawford has held posts at FDA and the U.S. Department of Agriculture and currently runs a food policy center at Virginia Polytechnic Institute and State University in Blacksburg. His nomination may draw opposition from some consumer activists because his center has received funding from industry groups.

Less controversial is the apparent pick to head the Office of Research and Development (ORD) at the Environmental Protection Agency. Paul Gilman, now policy director at Celera Genomics in Rockville, Maryland, is an ecologist and evolutionary biologist by training whose career path includes a stint as an aide to Senator Pete Domenici (R–NM) and posts at the Department of Energy, the White House Office of Management and Budget, and the National Academy of Sciences. With that wealth of experience, Gilman would make "an excellent choice," says Robert Huggett, a former ORD head who is now vice president for research at Michigan State University in East Lansing.

Conflict Crackdown Leaders of the top U.S. research universities have recommended some tough new rules for managing conflicts of interest. Noting that academia is facing a "substantial" risk of seeing its integrity questioned due to entanglements with industry, the Association of American Universities (AAU) on 9 October called on its 63 members to require researchers to make financial disclosures that go far beyond current legal requirements.

An AAU task force, co-chaired by presidents Steven Sample of the University of Southern California in Los Angeles and L. Dennis Smith of the University of Nebraska, Lincoln, says that all members of the faculty doing research—not just biomedical scientists—should disclose to university managers any financial holdings that could be "related" to their studies. Academics should also open their books to journal editors, the panel says, while the "publications should print this information so that it can become available to the public." At medical centers, the AAU says that the Institutional Review Boards that approve human subjects research should have authority to "prohibit the research" if a conflict is not properly managed.

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