"disturbing regularity," the report states, migrant laborers who frequent sex workers take HIV back to their home states.

Chris Beyrer, an epidemiologist at Johns Hopkins University who specializes in the spread of HIV in Asia, says he applauds the MAP report for emphasizing the connection between injection drug use and sexual risk groups. "They've got it exactly right," says Beyrer, who in 1998 published *War in the Blood: Sex, Politics, and AIDS in Southeast Asia*.

The news, however, isn't all bad. "The MAP network doesn't want to be alarmist … we see a window of opportunity," says Stanecki. The MAP report emphasizes, for example, that Thailand has used aggressive condom campaigns and education of high-risk groups to curb an epidemic that could have been much worse. According to MAP modelers, if Thailand had not intervened, 10% to 15% of its adult population might now be infected; the actual prevalence is 1% to 2%. That shows what can be accomplished—if the warning signals are heeded.

–JON COHEN

MAGNETORECEPTION

Animal Magnetism Guides Migration

Animals are the ultimate commuters. From butterflies to newts, many creatures roam the neighborhood—or globe—and still manage to find their way home. In this issue, two studies reveal how sea turtles and mole rats tap a basic navigational tool: Earth's magnetic field.

Loggerhead sea turtles migrate around the North Atlantic, encountering different magnetic fields en route. A team led by marine biologist Kenneth Lohmann of the University of North Carolina (UNC), Chapel Hill, reports on page 364 that the turtles detect these fields, like boundaries, and use them to stay on course. The study suggests a strategy that may guide one of nature's longest migrations.

And on page 366, a team led by neuroanatomist Pavel Němec of Charles University in Prague identifies for the first time an area of the mammalian brain that apparently processes magnetic field information. "This opens up a whole new area of research in magnetic sense," says biologist Michael Walker of the University of Auckland in New Zealand.

Earth's churning liquid core casts a magnetic field across the planet's surface. Birds, fish, crustaceans, and a host of other animals appear to use regional variations in the magnetic field, along with sensory cues such as sight and sound, to navigate. "We're faced with all these animals who go from place to place, sometimes over thousands of miles, with remarkable precision," says marine biologist Michael Salmon of Florida Atlantic University in Boca Raton. "But very few people have been able to figure out just how they do it."

Lohmann and his spouse, UNC biologist Catherine Lohmann, study loggerhead sea turtles that hatch on the eastern coast of Florida and immediately crawl into the moonlit ocean. The hatchlings head into the North Atlantic gyre: a circular ocean current that flows clockwise around the Sargasso Sea. Loggerheads loop the gyre, heading northeast toward Europe and then south, spending 5 to 10 years in the gyre's warm, rich waters before heading back to the North American coast.

In previous lab experiments, the Lohmanns and their colleagues found that loggerheads can sense magnetic field intensity and inclination angle. In the new study, they posed a broader question: Do the turtles use the regional magnetic fields they encounter to stay on their migratory path?

To find out, the researchers collected 79 hatchlings. Each hatchling was fitted with a tiny bathing suit, tethered to a computer-linked tracking system, and placed in a shallow lab tank. Outside the tank, a

Charging along. The Zambian mole rat reportedly taps the magnetic field to position nests (*above*), while some loggerhead sea turtles use it to navigate the North Atlantic (*right*).

CREDITS: (TOP TO BOTTOM) NEMEC *ET AL*; LOHMANN *ET AL*.

ScienceScope

Patent Challenge Grows The battle against a European patent for a breast cancer test went continent-wide this week. As *Science* went to press, researchers and clinicians from six European countries were poised to file formal opposition to a patent awarded last January to Myriad Genetics of Salt Lake City, Utah. It covers a test that detects mutations in the *BRCA1* gene that researchers believe are responsible for more than half of all hereditary breast cancers. Opponents say the patent gives Myriad an unfair monopoly on breast cancer testing.

The Institut Curie in Paris had already announced that it would oppose the patent (*Science*, 14 September, p. 1971). Now weighing in are human and medical genetics societies from five other European countries: Belgium, Denmark, Germany, the Netherlands, and the United Kingdom. In addition, on 4 October the European Parliament adopted a resolution opposing the patent.

Patent opponents, says human geneticist Gert Matthijs of the University of Leuven in Belgium, want to "make sure … that the social medicine we practice [in Europe] does not become exceedingly expensive because of patent rights." Myriad officials predict that their patent will stand.

Howling at Earmarks Critics and supporters of congressional pork-barrel spending on academic science projects found little common ground at a 1-day workshop on the issue in Washington, D.C., last week. Lawmakers last year "earmarked" a record $1.7 billion to universities for buildings and research projects that had not been requested by the White House. The meeting was held in the wake of a White House effort to persuade university and science groups to publicly oppose such practices (*Science*, 28 September, p. 2364).

Critics, including House Science Committee aide Dan Pearson, said that earmarking leads to taxpayer funding for questionable science. But one prominent ex-earmarker, former Louisiana Senator J. Bennett Johnston—now a lobbyist—noted that earmarks account for just a few percent of the government's $43 billion civilian R&D budget. He advised earmarking opponents to "put your efforts elsewhere, because you are not going to win." He also accused some universities of hypocrisy, publicly decrying earmarks but privately hiring lobbyists—such as himself—to win cash from Congress. Some schools, he charged, "want to bark with the dogs *and* howl with the coons."

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