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faster HIV test results ADHD brain differences colorful chinese warriors electronic fabrics?

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SVARMIN ALIEN TERMITES ON THE MOVE

THE WEEKLY NEWSMAGAZINE OF SCIENCE



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Cover In New Orleans' French Quarter, residents head indoors and turn off lights when swarms of Asian termites take flight to find mates. Research efforts are under way to control the damage and spread of these unusual, aggressive termites. (Photo by Scott Threlkeld © 2003 The Times-Picayune Publishing Co., all rights reserved. Used with permission of The Times-Picayune.) Page 344

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SCIENCE NEWS This Week

ADHD's Brain Trail

Cerebral clues emerge for attention disorder

Scientists have identified brain alterations that may underlie attention-deficit hyperactivity disorder (ADHD), a psychiatric condition that affects 3 percent to 6 percent of U.S. school children.

Children and teenagers with ADHD possess less tissue in parts of the brain's prefrontal and temporal lobes than those without psychiatric disorders do, neurologist Elizabeth R. Sowell of the University of California, Los Angeles School of Medicine and her coworkers have found. In addition, kids with ADHD display an excessive density of the neuron-rich tissue known as gray matter in regions of cortex toward the back of the brain, the scientists report. The cortex is the brain's outer layer.

These ADHD-related characteristics all occur within a brain network that, in the research team's view, regulates attention and controls behavior.

The new findings build on prior evidence that youngsters with ADHD, who lack concentration, self-control, and organizational skills, possess smaller total brain volumes than psychiatrically healthy children do (SN: 10/12/02, p. 227).

"We're now able to localize where brain changes occur that distinguish between kids with and without ADHD," Sowell says. Her team's investigation is chronicled in the Nov. 22 *Lancet*.

The scientists used high-resolution magnetic resonance imaging and a new statistical technique to generate maps of average cortical anatomy for 27 youngsters diagnosed with ADHD and 46 others with no psychiatric ailment. Volunteers in both groups ranged in age from 8 to 18. About two-thirds were male.

The study found differences between the groups in brain regions already implicated in the ability to hold separate pieces of information in mind and to maintain visual attention.

It's not clear why kids with ADHD showed excess gray matter density. The researchers theorize that these children may not develop enough white matter, the axonrich tissue primarily located below the cortex, thus increasing the relative density of gray matter.

Too few children participated in the new study to enable the researchers to probe for possible brain disparities between boys



AB. OF NEURO IMAGING

SIZED DOWN This color-coded image of the brain's left side depicts average regional size differences between children with and without ADHD. Regions in red and orange mark where size reductions were most prominent for children with ADHD.

and girls with ADHD or to rule out possible effects of prescribed-stimulant use on brain anatomy. A 2002 study conducted by another group found no evidence that these medications produce ADHD-relevant brain differences.

The new brain findings may be unique to ADHD's symptoms, Sowell adds. Different neural patterns have been observed in childhood ailments such as autism and fetal alcohol syndrome, which also include attention and behavior problems.

"Sowell's study is a step forward," remarks psychiatrist Jay N. Giedd of the National Institute of Mental Health in Bethesda, Md. "Still, it's puzzling and counterintuitive that her group found increased gray matter density in ADHD."

In other brain studies, Giedd has found smaller cerebellums in kids with ADHD than in their ADHD-free peers. The cerebellum, which lies at the brain's base and thus wasn't evaluated by Sowell's group, integrates sensations and motor functions and has numerous connections to the frontal lobe. —B. BOWER

Fetal Risk Inflammation in womb tied to cerebral palsy

For a woman who has carried her baby to term, inflammation of the uterine lining or the membrane surrounding the fetus nearly quadruples the chance that her baby will be born with cerebral palsy, a new study finds. Cerebral palsy normally strikes 1 or 2 children per 1,000 born after full-term pregnancies.

Yvonne W. Wu, a pediatric neurologist at the University of California, San Francisco and her colleagues identified 109 children at least 2 years old with moderate to severe cerebral palsy. As a comparison group, the doctors also studied 218 babies without the condition.

A review of records showed that 14 percent of the cerebral palsy infants had been born to women diagnosed with an inflammation of the uterine lining or fetal membrane shortly before or after giving birth, compared with only 4 percent of the healthy infants in the comparison group, the researchers report in the Nov. 26 Journal of the American Medical Association.

Doctors identify such inflammation, which usually indicates infection, by checking for fever, abdominal tenderness, and fluid discharge from the vagina. In the new study, the researchers found that 20 percent of the cerebral palsy infants' mothers had fevers during labor or birth, compared with only 7 percent of the control group.

Although the cause of cerebral palsy is unknown in most cases, a lack of oxygen to

SCIENCE NEWS This Week

a fetus has long been the chief suspect. Such asphyxia could result in brain injury in which motor coordination is lost.

But earlier research led Wu and her colleagues to suspect that inflammation plays a roll as well. Those studies turned up high concentrations of inflammatory molecules called cytokines in the blood of infants later diagnosed with cerebral palsy (*SN: 10/17/98, p. 244*).

The inscrutable origin of cerebral palsy suggests that a combination of factors is at work, says Karin B. Nelson, a pediatric neurologist at the National Institute of Neurological Disorders and Stroke in Bethesda, Md. "Things that cause rip-roaring infections are usually not what cause [cerebral palsy], or we'd have known it by now," she says. But a subtle infection, together with a clotting abnormality or a period of low oxygen in the womb, "could zap a fetus that might have been robust enough to withstand any one of these," she says.

Indeed, inflammatory proteins might interact with clotting factors—which are abundant in pregnant women—in some way that leads to brain damage, Wu and her colleagues hypothesize. Magnetic resonance imaging in the new study showed that many babies with cerebral palsy had brain damage similar to that seen after strokes, Wu notes.

This and the previous work should change how doctors treat pregnant women who show warning signs of inflammation in the womb, says Larry C. Gilstrap, an obstetric gynecologist at the University of Texas Health Science Center at Houston. Any pregnant woman with an infection of the fetal membrane or uterus, or whose "water breaks"—meaning the membrane has ruptured—should be treated promptly with antibiotics or induced to deliver if she is close to term, he says. —N. SEPPA

The March of History

Terra-cotta warriors show their true colors

The terra-cotta warriors buried near the tomb of the first Chinese emperor, Qin Shihuangdi, present a fierce challenge—to modern-day chemists. Since the site's discovery near Xi'an, China, in 1974, archaeologists have unearthed more than 1,500



COLORFUL CHARACTERS Although the terra-cotta warriors excavated so far have lost their original color coats, a novel restoration technique could preserve the paint layer (inset) on the thousands of warriors that remain in the ground.

of the life-size figures. But once the warriors see the light of day after more than 2,200 years of burial, their paint disappears, sometimes within minutes of exposure.

With an estimated 8,000 more figures still buried, scientists have been looking for ways to lock the paint in place. Now, a group of chemists in Germany has a technique that just might work.

The warriors were originally coated with polychrome—a material consisting of a lacquer base topped by a layer of pigment, explains Heinz Langhals at the University of Munich. Because water-saturated soil at the site has altered the lacquer, he says, the coating cracks and peels off once the warriors are removed from their soil encasements. Researchers have tried different polymer-based materials to strengthen the polychrome and secure it to the terra-cotta surface, but the polymer molecules have been too big to penetrate the coating.

Langhals and his colleagues decided to use hydroxyethyl methacrylate—an organic monomer used to make many plastics. The researchers saturated cotton compresses with the monomer and a polymerization agent and applied the preparation to terracotta fragments from a broken warrior. The water-soluble monomer diffused through the lacquer coat, partially replacing the water in the coat's tiny pores.

Then, using an electron accelerator, the researchers irradiated the fragments with electron beams. The electrons activated the polymerization agent, which stitched the monomers together into polymers, consolidating the polychrome. The researchers describe the restoration technique in the Dec. 1 *Angewandte Chemie*.

"It's a great idea," says Pamela Vandiver, acting director of the Smithsonian Center for Materials Research and Education in Suitland, Md. So far, the researchers have tested their technique on small fragments and shown that the polychrome remains stable for several years.

Working with the Bingmayong Museum in China, Langhals hopes to use his method to preserve an entire warrior, starting in early 2004. Since many of the warriors are in pieces, he and his colleagues will have to treat fragments individually before reassembling them.

Several potentially enormous sites at the tomb complex were discovered in December 2002. As archaeologists gear up to unearth more buried treasures from these, Langhals hopes to use his technique to preserve those new finds as well. —A. GOHO

Lake Retreat African river valley once hosted big lake

The valley of the White Nile, one of two main tributaries of Africa's longest river, may long ago have held a shallow lake that sprawled 70 kilometers across and stretched more than 500 km along the river.

Satellite images clearly show a continuous string of arc-shaped features that extends about 280 km southward from Esh Shawal, Sudan, along the eastern margin of the White Nile valley. Previous ground surveys found that the elevations of those landforms vary by no more than 2 meters, says Martin A.J. Williams, a geographer at Australia's University of Adelaide. West of these contours, the terrain slopes gently toward the river, dropping about 15 centimeters across each westward kilometer. East of the features, the ground rises at a steeper gradient of 3 meters per kilometer.

The consistent level of the features, like that of a gargantuan bathtub ring, marks the wave-scoured shoreline of an ancient lake, says Williams. North of Esh Shawal, traces of the lake's eastern shoreline become vague, because sediments dumped there by the Blue Nile have covered the area. However, signs of erosion along the opposite shore can be found more than 200 km north of the town. Neither the satellite images nor previous surveys provide any clue about where the ancient lake's southern shore may have been located. Williams and his colleagues describe their findings in the November *Geology*.

Because the southeastern shoreline is well defined, the arc-shaped features probably took a long time to form, says Michael R. Talbot, a geologist at the University of Bergen in Norway. The apparent absence of multiple shorelines at various elevations along the river valley indicates the lake was a permanent and stable feature, not one that rose and fell with the seasons and reached different levels each year.

The White Nile's ancient lake couldn't exist today because the river doesn't carry enough water to keep up with evaporation over a lake-size area. At some sites in the region, reservoirs can lose as much as 1 cm of water per day, says Williams.

Analyses of clay-rich sediments excavated from a trench near Esh Shawal suggest that layers now 5 m below ground level were deposited on the lake bottom more than 250,000 years ago. Williams and his colleagues suggest that the lake formed and existed between 420,000 and 360,000 years ago, during a wetter-than-normal period between ice ages. —S. PERKINS

This Won't Hurt ...

Tiny needles deliver drugs painlessly

Microscopic needles may one day join hypodermic needles and drug-loaded patches as a way to get medicines into the bloodstream. Whereas syringes hurt and patches work only for small molecules, painless microneedles could deliver medicinal proteins and other large molecules through the skin, say developers of the technology.

Mark R. Prausnitz of the Georgia Institute of Technology in Atlanta and his colleagues describe new methods for making arrays of both solid and hollow microneedles, as well as the first proof of the efficacy of hollow microneedles. They report their findings in the Nov. 25 *Proceedings of the National Academy of Sciences*.

The solid needle would work by riddling the skin with tiny holes, allowing drugs from an overlying patch or on the needles themselves to seep into the body.

To make it to the clinic, however, microneedles will need to be mass-producible and cheap, says Prausnitz. His team used microfabrication and etching techniques to make molds hosting up to 1,000 solid microneedle forms in a thumbnailsize piece of silicon, metal, or polymer. Filling the forms with metals or polymers resulted in hair-thin needles no longer than the width of the period at the end this sentence. Needles of these dimensions don't cause pain, since they can avoid nerves, but they also aren't as strong or penetrating as larger needles.

"There are various trade-offs between getting needles to go in, getting the needles to go in without hurting, and delivering



PRICKLY Unlike a normal hypodermic needle (right), microneedles, seen point on, have been shown to be painless.

enough of the drug," says Prausnitz. Microneedles would be especially beneficial for people with diabetes and others who need frequent injections, he notes. But Prausnitz suspects that the "real opportunity for microneedles is in the process of extended drug delivery."

To realize that possibility, the researchers have developed ways of fabricating hollow microneedles through which drugs can flow at controlled rates. The researchers have made such structures in several ways, including drilling microscopic holes through silicon and electroplating a thin layer of metal on only the inner surfaces of the needle forms the team created.

As a simple test of the efficacy of hollow microneedles, the scientists pulled glass pipettes to create microscopic tips and used them to inject insulin into diabetic rats. The treatment lowered the animals' blood sugar concentrations for at least 5 hours.

Showing that hollow microneedles can deliver drugs to animals "represents an

important milestone in the development of this technology," says Samir Mitragotri of the University of California, Santa Barbara.

Several biotechnology companies are developing microneedles for use in people. Robert Gale of Alza Corporation in Mountain View, Calif., notes that his company is developing solid, drug-coated microneedles, which the company hopes to market in 2 to 5 years. —K. RAMSAYER

Protein Portal

Enzyme acts as door for the SARS virus

A year ago, a mystery virus began to kill people in China. Causing an illness dubbed severe acute respiratory syndrome (SARS), the virus quickly spread beyond Asia and for a few months stirred fears of a worldwide epidemic.

With stunning speed, scientists identified the virus and decoded its genetic sequence (*SN*: 4/26/03, p. 262). Now, a research team has claimed victory in the race to identify the cellular receptor—the protein to which the virus attaches when it infects cells—for the SARS virus. Since the protein turned out to be a well-known one that had previously been implicated in heart disease, drugs that target the receptor are already under development. Some of those same compounds might serve as antiviral medications for SARS patients, say researchers.

Michael Farzan of Brigham and Women's Hospital in Boston and his colleagues went fishing for the receptor with a lure made of the molecule on the surface of the SARS virus that docks with the cell's receptor. They burst monkey-kidney cells, which the virus easily infects, and then cast the viralsurface molecule into the resulting debris.

The SARS-receptor molecule latched on to three proteins, but only one of these, angiotensin-converting enzyme 2 (ACE2), is typically found on the surface of mammalian cells.

Several subsequent experiments, reported in the Nov. 27 *Nature*, make the case that the human form of ACE2 is a SARS-virus receptor. First, human-kidney cells engineered to produce ACE2 fuse with cells engineered to make the SARS virus' surface molecule. Second, cells engineered to mass-produce ACE2 were more readily infected by the SARS virus than were normal cells. Third, an antibody to ACE2 slowed the replication of the virus in cells bearing the enzyme.

"We nailed it. It's lock-solid" that ACE2 is a receptor for the SARS virus, says Farzan.

Another virologist trying to identify the receptor agrees. The results are "very convincing," says Dimiter S. Dimtrov of the National Cancer Institute in Frederick,



Md. "It's absolutely amazing how quickly they did this."

Until now, ACE2 has largely interested cardiologists. Several decades ago, physicians began using inhibitors of a similar enzyme, ACE, to treat high blood pressure and heart disease. A few years ago, scientists discovered ACE2 and began to look for compounds that block its activities. There's a good correspondence between tissues that make ACE2—the heart, lungs, and kidneys, for example—and ones affected by the SARS virus, notes Farzan.

He and his colleagues are now looking into whether known ACE2 inhibitors block the SARS virus from cells. It's possible that these inhibitors may thwart ACE2's function but still allow the virus to grab onto the enzyme, cautions Farzan.

Gary Nabel, director of the National Institutes of Health Vaccine Research Center in Bethesda, Md., calls the new work a "fascinating discovery" but notes that the SARS virus may exploit proteins other than ACE2 as receptors. —J. TRAVIS

Electronic Thread

Fiber transistor may lead to woven circuits

Someday, the very fabric of your shirt might contain flexible electronic devices that monitor your vital signs or enable you to dial in the color or pattern you want to wear that day. Futuristic clothing of this sort may be closer to your closet now that researchers have developed a type of transistor-ona-fiber.

Josephine B. Lee and Vivek Subramanian of the University of California, Berkeley say that the perpendicular arrangement of a fabric's fibers should make it possible to wire transistors such as these new fiber ones into sensing devices, wearable displays, and other electronic devices. Conductive wires among the fabric's threads would provide the transistor-to-transistor links.

Unlike conventional transistor fabrication, which takes place at elevated temperatures and requires high precision and ultraclean conditions, making fiber transistors is "totally compatible with the weaving process," says Lee. She's slated to present this new work at an international meeting on electronic devices next month in Washington, D.C. The two researchers make their new transistors by coating hair-thin strands of aluminum with an electrically insulating film. Doing that requires oven temperatures, but the step is completed before weaving takes place. Atop the insulating film, the researchers deposit a layer of pentacene, an organic chemical

that behaves as a semiconductor.

In the lab, the researchers have demonstrated another important step in making fiber-based circuits: By positioning threads across the fiber transistors, the Berkeley team can deposit thin films of gold on the fibers except in the tiny

areas where the overlying thread masks incoming gold vapor. This process breaks the fibers into discrete transistor regions, each of which can be contacted individually with thin, metallic wires during the weaving process.

"Using the fibers of the textile as shadow masks points to a possibly inexpensive way of making transistors on fabric," comments Sigurd Wagner of Princeton University. On the other hand, pentacene transistors will require additional protective coatings to prevent degradation by moisture or exposure to the air, he notes.

For tasks such as sensing body temperature, even damaged transistors might work well enough, Lee says. She and Subramanian are now at work on the next step: weaving circuit-laden cloth from the new fibers. —P. WEISS

The Next MTBE Contamination from fuel additives could spread

The recent political debates on the use of two common gasoline additives, methyl *tert*-butyl ether (MTBE) and ethanol, suggest that refiners may have to rely more on alternative chemicals for oxygenating gas and reducing smog.

A University of California, Los Angeles (UCLA) research group has compared the in-ground behavior of MTBE, four alternatives, and basic gasoline constituents, such as benzene. The researchers analyzed data on more than 850 leaking underground fuel tanks in the Los Angeles area, as well as measurements of those contaminants in groundwater at various distances from the tanks. They conclude that at their present concentrations in gasoline, the alternative additives aren't as environmentally prevalent as MTBE, but that reformulations with higher concentrations could create problems comparable to those already caused by MTBE.

To meet air-quality standards implemented in the 1990s, many petroleum processors began adding compounds called oxygenates—for the most part MTBE, with ethanol as a distant second—to gasoline. The additives reduce emissions from burning fuel, but they also have environmental drawbacks.

> MTBE, which smells like turpentine, often escapes from leaking gas-storage tanks and spreads in underground plumes. The contaminant persists

in groundwater for years and is difficult to remove (*SN:* 4/8/00,

> *p. 229*). Some states now prohibit manufacturers from adding MTBE to gasoline to minimize pollution.

Ethanol is less persistent than MTBE in the environment, but it appears to enhance the diffusion of benzene, a carcinogen and a major ingredient in gasoline, when ethanol-enriched gas leaks from tanks.

GOLD FINGERS The vertical

threads of this tiny assembly

electronic components that

electronic textiles.

could one day become part of

contain the kinds of fiber-based

Several oxygenates other than ethanol could supplant MTBE as the gasoline additive of choice. They are frequent by-products of MTBE production and therefore already present at low concentrations in MTBE-enriched gasoline.

UCLA's Tom Shih and his colleagues detected MTBE in the ground at 83 percent of the leaking tanks, making it nearly as prevalent as benzene. The oxygenate *tert*-butyl alcohol occurred at 61 percent of the sites, and the other three oxygenates—all ethers similar in structure to MTBE—turned up 9 percent to 24 percent of the time.

Half of the MTBE plumes exceeded 84 meters in length, while *tert*-butyl alcohol plumes were 61 m in median length. Typical plumes of the other ethers were 35 m to 58 m long, Shih and his colleagues report in an upcoming *Environmental Science and Technology*.

"All indications [nevertheless] suggest that the alternative ethers would pose groundwater contamination threats similar to MTBE if their scale of usage were expanded," Shih says.

The concentrations of alternative oxygenates found around leaking tanks in the new study are already surprisingly high, says environmental engineer Susan E. Powers of Clarkson University in Potsdam, N.Y. —B. HARDER

SCIENCE NEWS

MUNCHING ALONG

Warning: Aggressive alien termites could be headed your way

BY JANET RALOFF

ut-of-towners flock to New Orleans for jazz, great food, and a chance to amble quaint, narrow streets overhung with wrought-iron balconies. What few tourists realize is that wherever they wander in this city, they're probably within a few feet of hordes of invasive termites. Indeed, New Orleans—and especially its French Quarter constitutes ground zero of the Formosan subterranean termite's North American invasion, entomologists say. The insects are chowing down on wooden structures, from houses to living trees. Consequently, New Orleans has also become a central proving ground for new technologies to find and attack these especially aggressive and resourceful insects.

At least eight southern states, Hawaii, and southern California

now host the alien termite known as *Coptotermes formosanus*. These insects create significantly bigger colonies—and, therefore, more damage—than do their native U.S. cousins, which reside underground and enter buildings only to forage.

Repellents and poisons work against the Formosan termites, but it's difficult to select an effective location for placing baits. In contrast to native, subterranean termites, which always enter a building at ground level, the aliens may never cross the ground because they can reside within buildings or in trees. So, exterminators now need to conduct a three-

WARTIME EMIGRES — Formosan termites appear to have entered the United States as stowaways on crates ferried back from the Pacific by military troop ships, such as these lining a Louisiana river just after World War II.

dimensional search to locate nests.

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Estimated costs to control *C. formosanus* and repair damage the insects have caused in the United States now run about \$1 billion a year, says Alan R. Lax of the U.S. Department of Agriculture's Southern Regional Research Center in New Orleans. In comparison, the much more widespread, native North American termites cost the United States \$10 billion each year.

So far, the Formosan termite—long endemic throughout the Asian Pacific—has spread slowly since it disembarked at several southern seaports about 60 years ago. However, northerners shouldn't be smug. This year, Xing Ping Hu of Auburn (Ala.) University found a colony in a part of Alabama where last winter's temperatures dipped to -15°F. That's an environment, she says, that "previously we would have considered uninhabitable."

This insect spreads via infested boats and shipments of landscape timbers, mulch, and potted plants. At the Society of Environmental Journalists' annual meeting in September, Gregg Henderson of Louisiana State University in Baton Rouge argued that if infested boats and products aren't detected and quarantined, Formosan termites could establish successful colonies as far north as Boston on the East Coast and Tacoma, Wash., on the West Coast.

STEALTHY INVADERS Biologists suspect that the 3/16-inchlong aliens arrived in North America during or shortly after World War II as stowaways in crates on troop ships returning from the Asian Pacific. It can take new colonies at least 7 years to reach a size that creates detectable damage. Indeed, these insects evaded detection for about 2 decades because they were mistaken for native termites of the *Reticulitermes* genus.

Eventually, New Orleans' pest-control specialists realized that local termites, always a problem in that town, had started

behaving strangely. For instance, termites had begun hollowing out live trees instead of just dead ones. And some colonies actually nested in homes and other structures rather than just dining on them. Young adults also instituted a new ritual: flying in dense night swarms as millions of the newly fertile individuals sought mates and homes.

Smaller but similar infestations turned up in several other southern military-port cities, such as Charleston, S.C. Entomologists finally identified the insects as *C. formosanus*, a species that had for centuries destroyed

wooden structures throughout the countries of East Asia.

Although native subterranean termites forage outside their nest for woody food, they return each day to their underground warrens to rest and bring nourishment to their colonies. Not so their alien cousins. If Formosan termites find reliable food and drink such as framing timber and rainwater—they'll permanently nest within a building's walls.

Such an aboveground colony may come to light only when seemingly solid floorboards become squishy underfoot or a population overgrows its space and begins burrowing out through plaster walls. Some southern home owners have removed wallpaper to find large patches of wallboard and framing replaced with a vast span of cemented soil and feces, known as carton, housing many thousands of squirming, milk-colored termites.

SCIENCE NEWS

NOT NEIGHBORLY For the past 5 years, Matthew T. Messenger of the New Orleans Mosquito and Termite Control Board has been studying 18 colonies of Formosan termites living in a 31-acre park just north of the French Quarter. Each population, which typically consists of 500,000 to 3.5 million individuals, has proved genetically distinct. Huge squadrons of soldiers jeal-ously guard a nest's tunnels and chambers and patrol alongside the community's foragers. To visually distinguish members of neighboring populations, Messenger fed them dyes that left many of the insects either red or blue for up to 6 months.

With this color coding, Messenger established that Formosan termites are anything but neighborly. Unusually feisty under the best of conditions, the soldiers more aggressively attacked mem-

bers of an adjacent population of its species than they did wandering individuals from a more distant Formosan colony.

Color coding also helped Messenger gauge the difficulty in eliminating this pest. For instance, he provided poisoned food to three large colonies of dyed termites in the park last year and watched them completely die off within 3 months. However, only one of the several-acre nests became a ghost town. Within days of the initial poisoning, neighboring colonies of a different color sent squatters into the outer edges of the dying nests. By 7 months after the poisoning, Messenger reports, "one dead colony had been completely reinvaded."

This confirms that eliminating the occasional nest can be pointless, Lax says. To be effective, he maintains, Formosan termite treatment must be administered widely and repeatedly.

That's why his agency for 5 years has been spearheading a federal program known as Operation Full Stop. Its goal is to prove that if buildings and public lands in a broadly infested area—such as the French Quarter—are treated conscientiously, neighborhoods can empty mature nests and keep them vacant.

The problem is that New Orleans is a Formosan termite's idea of heaven, Lax notes. Year-round, the weather remains warm and damp. Home owners frequently permit moist, sheltering vines to blanket exterior

walls and balconies. Adjacent buildings often share a wall, so as pest-control teams treat one building, a termite population can hide out next door, or even upstairs.

Messenger recently visited Hong Kong, where signs of the termite's ravages appear everywhere, from boats to skyscrapers. In one luxury penthouse 23 stories up, Messenger recalls, "Formosan termites were eating maple flooring up to its lacquer finish, so you could actually see them running around under the lacquer."

Then, there are the trees. Although a native termite colony might occasionally infest a tree, it's almost invariably a dead one, Messenger says. When he began his studies in Armstrong Park, Formosan termites infested 251 of the park's 708 apparently healthy trees. The 24 affected species included oaks, red maple, and redbud. Many trees in the park have since died or been treated. In most of New Orleans, the Formosan termite's arboreal nesting comes to light only when a trunk gets so hollowed out that it snaps during a storm.

STALKING TERMITES The termites in New Orleans shun exposure to the elements, except for the few-hour span in their life histories when new adults swarm. USDA is evaluating several technologies to home in on the especially well-hidden Formosans. For instance, pricey infrared cameras can pick up spots in walls and trees where termite activity is generating heat.

Microwave systems—the entomologist's version of the radar gun—bounce beams through building materials or trees. Where they hit moving objects, such as teeming termites, they register an anomaly. Pest-control operators can then drill into a wall and insert a fiberoptic camera, essentially a laparoscope, to confirm the insects' presence.

Finally, several new acoustic systems are eavesdropping on termite noise. Explains Lax, there are subtle sounds when the bugs chew and tear wood fibers and when they bang along their tunnels (*http://www.sciencenews.org/20031129/formosa1.wav*).

Even without auxiliary equipment, Messenger notes, "on a really quiet night, you can hear these guys munching around. And if you tap on a wall, they'll bang their heads," presumably drumming an alarm to nest mates.

For the past 2 years, Hu's team at Auburn has been training dogs to sniff out Formosan termites. In field tests, they perform reliably both inside buildings and out, Hu says. Their primary limitation is that they miss Formosans in ceilings and high in walls.

NO END IN SIGHT Most people who have confronted Formosan termites would like to see them eliminated. However, "we can't possibly do that," says Frank S. Guillot, who coordinates USDA's Formosan termite program. The invaders are too well established, so the best people can hope to do is to manage populations, he says. His group and others have begun intensively studying the insect to identify its vulnerabilities.

At the Entomological Society of America's annual meeting in Cincinnati last month, Louisiana State's Henderson reported making headway on understanding why colonies of this species have unusually high proportions of soldiers. In native subterranean termite populations, perhaps 2 percent of individuals mature into soldiers. The share in Formosan populations

can be 20 percent, Henderson says.

Only termite soldiers develop what is called a frontal gland, a huge organ that secretes a signaling chemical, or pheromone. Henderson's group identified six novel proteins and seven acids in the Formosans' secretion. In lab tests, the scientists showed that the secretion not only serves as an alarm but also as a biochemical stimulus for transforming more of a colony's workers, which are immature termites, into soldiers.

The findings suggest a new strategy that exterminators might use for "messing up the colony's structure," Henderson says. If one or more elements of the secretion could be applied to baits, water, or infested soil, even a larger share of a colony's members might become soldiers. This could "put a potentially catastrophic drain on the colony," he says, because soldiers, as the only sterile members of the population, don't contribute directly to reproduction. Soldiers also don't collect food, so increasing their ranks would put greater foraging demands of the remaining workers.

To date, most efforts to control Formosan termites have focused on poisoned baits and repellent treatments for vulnerable building materials. At the Cincinnati meeting, Henderson's group reported new advances on both these fronts. For instance, the



GET OUT! — Damage to a Formosan

termite nest brings hoards of workers

protecting them. Inset: Soldiers of the

Formosan termites (bottom) can be

by the oval shape of the alien's head.

soldiers (with large orange heads)

(whitish) scrambling to repair the hole and

distinguished from their U.S. cousins (top)

Baton Rouge biologists have isolated an oil known as nootkatone from the roots of a grass called vetiver. This woody-scented oil, which turned out to have been used commercially to add citrus flavor to sodas, repels Formosan termites for up to a year. The scientists also described isolating constituents of sesame oil that are both repellent and poisonous to Formosan termites.

Moreover, scientists have known that termites would follow a line drawn with ink. Henderson's team has now isolated a component-2-phenoxy ethanol-that's intoxicating to Formosan termites. One way to boost the efficacy of a poison is to add agents

that lure termites to it. Today's termiticides use a food, such as cellulose, as a lure. However, Henderson says, a potentenough nonfood lure, perhaps 2-phenoxy ethanol, could bait termites to a poison that wouldn't offer any nutrition.

Maureen S. Wright, a member of Guillot's team, is developing a biological warfare agent-the fungus known as Paecilomyces. Her colleague Mark Jackson at USDA's research center in Peoria, Ill., has worked out a low-cost way to produce large batches of the fungus.

In field trials, Wright's group drilled holes into infested trees and pumped in a liquid containing the fungus. It proved remarkably deadly; moreover, the fungus also grew inside the treated trees, suggesting that the treatment will last over extended periods.

The researchers made another promising finding when they

detected foraging termites carrying the infection back home and sharing it with nest mates as they groomed each other. "Theoretically," Wright says, this fungus "could control the entire nest."

Several pest-control companies are now looking to license that just-patented biological-control system.

CONTROL WON'T COME CHEAP Excellent technologies already exist for fighting the Formosan termite's U.S. advance, says Grady J. Glenn of Texas A&M University in

College Station. The problem, observes this entomologist who for 20 years ran a pest-control company, is convincing exterminators to invest in costly technologies.

He notes that many companies resist buying a \$300 device for detecting moisture, which usually signals a burgeoning termite colony or water leaks that can promote termite infestations. If companies view those meters as too expensive, Glenn says, what's the likelihood they'll spring for \$10,000 infrared cameras or a microwave gun that has to be leased at several

hundred dollars a month?

WALL OF TERROR — Part of Formosan-termite nest extracted

from an apartment in New Orleans' French Quarter.

Under USDA funding, Glenn is completing the development of a computer-aided training program for the pest-control industry. His program aims to communicate the nature of the alien termite and value of the still-pricey tools needed to control it.





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TESTING TIMES

The importance of identifying HIV infections before it's too late

BY BEN HARDER

he 27-year-old woman had just delivered a healthy baby girl at Cook County Hospital in Chicago when obstetrician Julie B. Schmidt entered the maternity suite bearing bad news. Just an hour earlier, in the throes of labor, the young woman had consented to an HIV test. Now, Schmidt had the result. As gently as possible, the doctor told the mother she had the virus. The new information demanded immediate action: With the right course of drugs and a dose of luck, the newborn could be saved from infection.

Ideally, drug treatment for a pregnant, HIV-infected woman and her fetus begins months ahead of delivery. That regimen reduces the chance of mother-to-child transmission to less than 1 percent. Without a diagnosis or antiviral drugs, that risk can soar to 25 percent.

The physicians at Cook County Hospital capitalized on their eleventh-hour discovery and gave the newborn drugs immediately. The baby escaped infection.

Medicine may have helped avert one tragedy that day, but such close calls underscore the need to discover more HIV infections earlier, and not just among pregnant women. People who are diagnosed with HIV infection soon after they acquire it get the most benefit from state-ofthe-art therapies that can extend their lives by years.

The rest miss out on life-sustaining treatments and are at high risk of spreading the virus. An estimated 180,000 to 280,000 people in the United States-about one-quarter of those infected with HIV-don't know

it, and they cause about two-thirds of new infections, estimates Robert S. Janssen, who works on HIV and AIDS prevention at the Centers for Disease Control and Prevention (CDC) in Atlanta.

By and large, Janssen says, "when people learn that they're infected, they take steps to reduce the risk of transmitting to partners." That explains why the government's current HIV-prevention initiative aims to shorten the time it takes to identify people infected with the virus.

A new rapid blood test, which helped diagnose Schmidt's patient, is playing a central role in that effort. The test is being applied by a makeshift militia of researchers, health-care providers, and community-based health workers, trained to use it.

Some HIV fighters caution that hurried and imperfect implementation of rapid testing could mean that some people will get lifeshattering information but won't receive the life-saving care that should follow.

To help make decisions about whom to test, researchers are working to identify groups of people that are likely to have high proportions of undiagnosed HIV cases. Schmidt's patient belonged to three of those groups: She was poor, African American, and presumably infected through heterosexual contact.

RAPID RESULTS If Schmidt's patient had received standard prenatal care, she might have been diagnosed months earlier. To help head off cases of mother-to-child HIV transmission, many obstetricians routinely offer HIV tests to women early in their pregnancies. Some states require such tests. But Schmidt's patient, like many expectant mothers from inner cities, showed up for care only when she was in labor.

That's one situation where rapid testing is invaluable, says Mardge H. Cohen of the Cook County Bureau of Health Services in Chicago. Last November, the Food and Drug Administration approved

> the OraQuick Rapid HIV-1 Antibody Test, which is manufactured by Abbott Laboratories of Abbott Park, Ill. Cohen runs the Chicago arm of a CDC-funded nationwide study that provided OraQuick kits to Schmidt's staff.

> "The case for rapid testing is pretty clear in labor and delivery," says Cohen. Of hundreds of pregnant women to whom the investigators offered rapid HIV tests at four Chicago hospitals, including Cook County Hospital, nearly 80 percent accepted. About 1 percent have tested positive for HIV, and most got their results within an hour, Cohen and her colleagues report in the Sept. 12 Morbidity and Mortality Weekly Report. Had they used conventional HIV testing,

none of those diagnoses could have been made in time for doctors to deliver antiviral treatment in the crucial hours around childbirth.

Diagnosing an HIV infection requires at least two steps. Conventionally, an initial blood screening, known as an HIV ELISA assay, can give either a negative or a preliminary positive indication that a person's immune system has encountered HIV. The preliminary positive result typically leads to a repeat ELISA test and must be confirmed by another, more specific HIV test to rule out the possibility of false-positive results. Because both tests must be done by specialized staff using sophisticated lab equipment, getting a result back to someone who has been tested can take 2 weeks.

The OraQuick rapid test, in contrast, can provide a person who may have HIV with nearly as reliable a result in under an hour and with little fuss. Its self-contained, handheld testing kit con-





sists of a readout device, a loop for collecting a blood sample-or, in a version under FDA review, a saliva sample—and a vial containing a developing solution. Most health-care workers, once familiar with the test, can process a sample and interpret the results within 20 minutes. Data that FDA reviewed before approving the test in 2002 indicate that results from the rapid test are accurate more than 99 percent of the time. Still, any positive OraQuick result must be confirmed with a slower, more specific test to rule out even the small chance of error.

In January, FDA approved the use of rapid-testing kits in tens of thousands of facilities that weren't previously capable of analyzing HIV test results in-house. Since then, state and federal health agencies have funded rapid testing in settings such as physi-

cians' offices, jails, sexually transmitted disease (STD) clinics, and mobile testing units that visit nightclubs, gay-pride events, and places where prostitutes and drug abusers congregate.

MISSED OPPORTUNITIES One-hour HIV testing will be instrumental not just in low-income maternity wards, but also throughout inner cities where people seek health care only sporadically, says Sam Niedbala of OraSure Technologies, the Bethlehem, Pa., company that created the OraQuick test. Niedbala says that the quickness of the test can prevent a frequent and frustrating outcome of conventional testing: About 20 percent of HIV-infected people fail to return to a clinic or doctor's office for the test results.

"With the rapid test," Niedbala says, "they can have a test done . . . while they're standing there."

"Rapid testing certainly has a role in emergency rooms and [STD] clinics, where you get one crack at the patient," says Daniel Klein, chief of infectious diseases at Kaiser Hospital in Hayward, Calif. However, he says, it's less critical at his hospital and others that serve relatively affluent populations because patients who request HIV tests tend to return for the results. What's needed in such settings, says Klein, is more frequent use of conventional tests among people who don't request them but whom doctors suspect to be at substantial risk of infection.

To understand what clues doctors could use to identify people who might benefit from HIV testing, Klein and his colleagues combed through medical charts of 440 people whom doctors at the hospital had diagnosed with HIV in 1998. Men, ethnic minorities, and people who got tested only after a physician suggested

it generally had more severely ravaged immune systems than did other HIV-positive people. The degree of immune deficiency in a person correlates with how long HIV has gone undetected. The researchers reported their findings in the Feb. 1 Journal of Acquired Immune Deficiency Syndromes.

Another pattern also stood out. A year or more before testing positive for HIV, "a significant minority of patients had STDs but weren't tested for HIV," Klein says. If all patients treated for STDs had been tested for HIV at the same time, many HIV cases might have been turned up earlier, he contends.

The implication, Klein says, is that "you get your greatest bang for your buck if you go after people with STDs" or a history of STDs and no corresponding HIV tests. "Someone who had gonorrhea 10 years ago and is now monogamous and happily married could have picked up HIV 10 years ago," he says.

The CDC data also point to factors associated with late diagnosis, which researchers typically define as that occurring less than a year before AIDS symptoms set in. Hispanics and African Americans are about twice as likely as non-Hispanic whites to get a late HIV diagnosis, researchers reported in the June 27 Morbidity and

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Mortality Weekly Report. Heterosexuals who don't use intravenous drugs have a relatively low risk of getting HIV, but if they do become infected, they are more than twice as likely as men who have sex with other men, and 4 times as likely as intravenous-drug users, to have their infection diagnosed late. Many belatedly diagnosed heterosexuals are immigrants who may have been infected overseas and who have limited access to health care in this country.

Many people are diagnosed late because they wait to get tested until they show symptoms of AIDS, which can take a decade to develop following infection with HIV, says CDC's Janssen.

NOT SO FAST Like Klein, Rochelle P. Walensky of Massachusetts General Hospital in Boston considers widespread testing the

key to earlier diagnosis, whether or not it involves rapid testing. Rather than having test providers try to single out people who may be infected, she advocates systematically offering tests to all patients in settings where HIV is prevalent.

Before such all-patient screenings became routine at Boston Medical Center, Walensky says, 9.3 people sought testing each month on average, and 1.3 people tested positive. After staff began preemptively offering tests to all patients in 1999, an average of 33.8 got tested each month and 2.3 HIV infections were diagnosed monthly, Walensky and her colleagues reported in the April 22, 2002 Archives of Internal Medicine. Not only does that get more infected people into treatment, but it also cuts off potentially extensive branches of HIV transmission.

At the February 2003 Conference on Retroviruses and Opportunistic Infections in Boston, Walensky and her colleagues reported that 1.6 percent of preemptive HIV tests at Boston Medical Center and three other Massachusetts hospitals resulted in an HIV diagnosis, whereas statewide only 0.9 percent of tests that people had sought out themselves led to an HIV diagnosis.

While advocating widespread testing, Walensky cautions against switching too hastily to rapid tests. Despite the relatively high precision of the OraQuick assay, she says,

its results aren't definitive without confirmation.

Furthermore, says Jean F. McGuire, a former assistant commissioner of public health in Massachusetts and one of Walensky's research collaborators, the sheer number of rapid tests being conducted means that a small but significant number of false positives are turning

up. False positives "create incredible turmoil for clinicians" and undermine public confidence in health services even though confirmatory testing soon reveals the error, she says.

Also, rapid testing's implementation might outpace the delivery of services that connect HIV-infected people with medical care, McGuire says. She also worries about ad hoc testing at, for example, bars and nightclubs. "I'm troubled about people who might be in altered states making decisions" to get tested, she says.

If full-service counseling and referral services for further testing and care aren't on hand where people get tested, they may not know what to make of positive results, McGuire says. Even with rigorous current standards for posttest counseling, one in three people in Massachusetts waits at least a year after being diagnosed with HIV before seeking medical care, McGuire says. That fraction could grow if hurried, haphazard counseling accompanied rapid testing.

She encourages rapid testing that's conducted by organizations that have fine-tuned their procedures for testing and counseling and that have strong roots in a community. In the end, she points out, it's what people do with the results of a medical test that determines whether testing makes a difference.

ORASURE



ACCELERATED DIAGNOSIS - A new HIV test that produces results in less than an hour could shave years off the delay between infection and diagnosis for many people.

OF NOTE

UK halts badger kill after study of TB

The British government this month ended the controversial practice of killing badgers on farms whenever any of the cattle there have been diagnosed with tuberculosis.

Badgers in Great Britain have been known to carry TB and experiments have shown they can transmit it to cattle, but whether cows often catch the disease from badgers outside the laboratory has proven controversial. Unpasteurized milk from sick cattle can then give TB to people, so for more than 2 decades, health authorities have had local badgers killed if a cow develops TB.

Badger fans objected, and in 1998 the government set up a trial of three alternative approaches: leaving badgers alone; culling them in reaction to detection of TB, which is the current practice; or proactively culling to keep badger numbers low even when TB hasn't been detected. The trial included farmland in 10 locations around England.

A government-appointed group of scientists overseeing the trials, chaired by John Bourne, former director of the Institute for Animal Health at the University of Bristol, has concluded that results in hand so far justify ending reactive culling.

Cattle in test areas with reactive culling caught TB 27 percent more often than did cattle in areas where researchers left badgers alone. On Nov. 4, the government announced the end of that part of the test, but it will continue monitoring to see how well proactive culling works.

The disease has not been found to afflict badgers in North America. —S.M.

EARTH SCIENCE Fill 'er up . . . with a few tons of wheat

If you think it takes a lot to fill up your vehicle's gas tank, you're right. A new analysis suggests that each gallon of gasoline is derived from an amount of ancient plant matter equivalent to the vegetation in a midsize wheat field.

Most of today's oil started out millions of years ago as tiny aquatic plants called phytoplankton, says Jeffrey S. Dukes, an ecologist at the Carnegie Institution of Washington in Stanford, Calif. After those organisms died, the forces of heat, pressure, and time transformed their carbon-based remains into a power-packed fossil fuel.

There are about 4.14 kilograms of carbon in a gallon of gasoline, says Dukes. To calculate how much aquatic plant matter it would take to supply that carbon, he analyzed nature's oil-making process. Many plants decompose right after they die, so their carbon is immediately recycled into ecosystems, primarily into carbon dioxide. The carbon from other plants may eventually end up in oil trapped in untappable pockets.

Overall, only about one carbon atom out of every 10,750 from ancient phytoplankton ended up in recoverable oil, says Dukes. Therefore, he calculates, it takes about 44,500 kg of carbon from ancient plant matter to make a gallon of gasoline.

Because plants are only about one-half carbon, the carbon in each gallon of gasoline corresponds to a whopping 89 metric tons of vegetation, says Dukes. That's approximately the same amount of plant matter—roots, stalks, and all—that grows in a 40-acre wheat field just so people can drive 30 kilometers, he adds. Dukes reports the results of his analysis in the November *Climatic Change*.—S.P.

Drug cuts recurrence of breast cancer

Letrozole, a drug that derails the body's production of estrogen, reduces breast cancer recurrences in women who have exhausted the usefulness of the anticancer drug tamoxifen, a new drug trial has revealed.

Tamoxifen stops breast cancers in many women by interfering with estrogen's proliferative effect on tumor cells. But taking tamoxifen for more than 5 years provides no additional benefit, compared with going off the drug after that period.

Researchers identified 5,157 postmenopausal women who had taken tamoxifen for about 5 years and randomly assigned them to take either an inert pill or letrozole, which wipes out nearly all estrogen in the body.

The scientists stopped the study when it became clear that the group receiving letrozole had roughly three-fifths as many breast cancer recurrences as did women getting the placebo, says study coauthor Paul E. Goss, a medical oncologist at Princess Margaret Hospital in Toronto. Researchers then offered letrozole to all participants, each of whom had been followed for 2.4 years on average. The report appears in the Nov. 6 New England Journal of Medicine.

Letrozole disables an enzyme called aromatase, which the body needs to make estrogen. Another aromatase inhibitor, the drug anastrozole, is also being tested for cancerfighting abilities (*SN: 11/24/01, p. 327*).

Although tamoxifen's anticancer effect levels out at 5 years, there's no question that the drug imparts a residual benefit even after long-term users stop taking it. Indeed, no one knows how long the benefits of tamoxifen or the aromatase inhibitors might linger. That and the question of whether the drugs might interact in good or bad ways when given simultaneously are the topics of several studies now under way.

Letrozole is marketed as Femara by Novartis in New York, which was a sponsor of the newly reported trial. —N.S.

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MEETINGS

BRAIN DEVELOPMENT Protein triggers nerve connections

Neuroscientists are slowly learning that neurons aren't the only stars in the brain. Instead, they're part of an ensemble performance involving other types of brain cells collectively known as glia (*SN:* 4/7/01, *p.* 222).

In particular, glia known as astrocytes make up about half the cells in the brain, although their exact role has remained murky. In 2001, a research group led by Ben Barres of Stanford University School of Medicine reported that astrocytes somehow enable nerve cells to form the specialized brain connections called synapses. Nerve cells grown without glial cells in the neighborhood develop far fewer synapses than normal, the scientists found.

Now, Barres and his colleagues have identified a molecule secreted by astrocytes that controls synapse formation. It's a relatively large protein called thrombospondin. When applied to nerve cells growing without glia in a dish, says Barres, "thrombospondin is sufficient to greatly increase the number of synapses." The protein, he adds, appears in the developing brain at just about the time when synapses first emerge.

Thrombospondin isn't the whole story. The synapses that it spurs to form look normal, but they don't function, notes Barres. At least one still-undiscovered signal from astrocytes turns on the newly formed synapses, he says. —J.T.

CANCER

Cleaning up glutamate slows deadly brain tumors

A protein that removes excessive amounts of the amino acid glutamate from around nerve cells may protect a brain from tumors, according to two studies. Researchers could soon test whether drugs that increase production of this glutamatesweeping protein stop otherwise-fatal cases of brain cancer.

Glutamate is essential to the healthy brain. It's one of the many compounds that nerve cells use to signal each other. Over the past few years, cancer researchers have discovered that many brain tumors, particularly ones called gliomas, secrete massive amounts of the amino acid. The tumors seem to wield glutamate as a machete of sorts, carving out room for growth by using Society for Neuroscience New Orleans, La. Nov. 8 – 12

the molecule to stimulate nerve cells until they die (*SN: 9/1/01, p. 133*).

The healthy brain uses the protein called excitatory amino acid transporter 2 (EAAT2) to mop us excess glutamate outside nerve cells. In previous studies, researchers at George Washington University in Washington, D.C., genetically engineered mice to overproduce EAAT2. The scientists recently injected glioma cells into the brains of these mutant mice and found that the resulting tumors grew more slowly than they would have in the brains of typical mice.

Moreover, the mutant mice were slower to start experiencing seizures caused by their brain tumors and suffered less nerve cell death around the tumors than normal mice do, says Jamie L. Maguire, now at the University of California, Los Angeles.

Kaleb H. Yohay of Johns Hopkins Medical Institutions in Baltimore recently surveyed the amount of EAAT2 in glioma samples from 60 patients. "There seems to be less of this major glutamate transporter in the higher-grade, more-invasive tumors," he says. Having less EAAT2 may prolong the time that glutamate from a glioma can kill nerve cells, he suggests.

As part of an effort to identify new treatments for a wide range of brain diseases, Yohay's colleague Jeffrey D. Rothstein recently screened more than 1,000 existing drugs, looking for ones that increase EAAT2 production. As it turned out, some common antibiotics do the trick. Given that there is no consistently effective treatment for gliomas, physicians will probably be eager to test such EAAT2 boosters on people with the tumors. —J.T.

AIDS HIV protein breaks biological clock

Among the many troubles HIV causes, is apparently a disruption of a person's daily, or circadian, rhythms. "Sleep seems to be a persistent problem" in HIV-infected people, notes John P. Clark of the University of Minnesota at Minneapolis–St. Paul.

The AIDS virus typically infects immune cells, so it hasn't been clear how it might alter the body's biological clock, which is controlled by a brain region called the suprachiasmatic nucleus (SCN). HIV, however, can infect brain cells within as little as a few weeks after a person has contracted the virus. Clark and his colleagues exposed living slices of SCN tissue from rodents to an HIV protein called Tat and found that the protein altered the slices' circadian rhythm of electrical activity. Researchers used to think that Tat turned on only viral genes needed for HIV to replicate, but they now suspect that the protein is a toxin and may have other roles (*SN: 11/6/99, p. 300*).

Clark's team also found that live mice getting injections of Tat into their SCNs changed the time of day when they typically run on their exercise wheels. Given these results, the viral protein is probably part of the explanation for the perturbed circadian rhythms of HIV-infected people, Clark concludes. —J.T.

There's no faking it

You can't call the Dutch sexist. At last year's meeting, scientists from the Netherlands amused and shocked U.S. neuroscientists with a brain-imaging study of men achieving orgasm. The same research team returned this year with images of the brain activity of women reaching climax. In an added twist, the investigators contrasted the brain activity when a woman faked an orgasm and when she actually had one as best as they could tell.

Hopeful of finding ways to help men and women who suffer from sexual dysfunction, Gert Holstege of the University of Groningen and his colleagues have been recruiting men and women willing to undergo positron emission tomography (PET) brain scans while being manually stimulated to orgasm by a spouse, girlfriend, or boyfriend. While ejaculation offered proof that a man had reached climax, a female orgasm was confirmed by physiological measurements such as heart rate and anal pressure.

As expected, areas of the brain previously implicated in pleasure showed increased activity in both men and women having orgasms. In fact, Holstege says, orgasmic brain activity resembles that seen in a person taking heroin. Overall, the male and female brain activity during orgasms closely matched. "Basically, 95 percent is the same," says Holstege.

Before their partners began to stimulate them, the women were asked to fake orgasms. They couldn't fool the PET scans. The researchers observed a very different pattern of brain activation during faked and real orgasms. During fakes, many of the brain regions with increased activity were ones involved in muscle control. —J.T.

Books

A selection of new and notable books of scientific interest

THE BEAST IN THE GARDEN: A Modern Parable of Man and Nature DAVID BARON

By the middle of the past century, large carnivores such as wolves, bears, and mountain lions were all but extinct in most of the United States, as a result of hunting and human encroachment. Today, as Baron puts it, protecting nature has become a "core American value." Hence, these animals and their



ence, these animals and their prey, such as deer, geese, and raccoons, have seen massive population increases in the past 25 years. Mountain lions may be as abundant in the West as when Lewis and Clark made their expedition there. However, the human population also continues to swell and urban areas spread, so the boundaries

between urban and wild areas are blurring. This is evident in towns such as Boulder, Colo., where, by the late 1980s, mountain lions were regularly spotted on lawns and driveways. Most people believed these cats would avoid human contact and didn't consider them a threat. Then, pets and finally a young man fell prey to the big cats. Baron examines what happened in Boulder, as he considers the issue of how we can, or perhaps can't, coexist with wild animals. **Norton, 2004, 277 p., hardcover, \$24.95**. COOK: The Extraordinary Voyages of Captain James Cook

Few men have had as much written about them as Captain James Cook, cited by many historians, especially in Great Britain and Australia as the greatest sea explorer of all





time. Most of the previous tales of this British maritime giant have charted his travels throughout the Pacific. Thomas proposes that the time has come to focus instead on Cook's anthropological and scientific contributions. The text omits Cook's early life story

and fast-forwards to age 39, just before he began his trio of epic voyages. Thomas, a professor of anthropology, draws from voyage journals and illustrations to examine Cook's influence on and study of natives in the Pacific islands. He explains how Cook defined stereotypes of those people that linger to this day and reviews how Cook's sailors introduced what would come to be devastating venereal diseases to native populations. However, this biography is neither a heroic nor a defamatory look at Cook but rather an attempt to deal with the "messy actualities of the past," writes Thomas. In this vein, Thomas details Cook's legacy from mapping newly discovered regions and colonizing lands, including Australia, Antarctica, and New Zealand. Furthermore, the author charts the flora and fauna logged by Cook and his crew as they landed in these exotic locales. This is a definitive book on a mythic character. Walker, 2003, 467 p., b&w photos/illus., hardcover, \$28.00.

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LETTERS

Leash leader

My attention was immediately drawn to "Leashing the Rattlesnake" (*SN: 9/27/03, p. 200*). You see, in the late 1970s, as a graduate student at the University of California, Davis, I developed a snake-tethering technique with the assistance of one of the campus veterinarians, Scott E. McDonald. The article falsely attributes rattlesnake leashing to others.

DAVID F. HENNESSY, SACRAMENTO, CALIF.

Yes, David Hennessy and five other authors describe the loop implant in a Behaviour article in 1981. Ron Swaisgood tried that method before deciding to use duct tape. He never claimed to have invented the implant.—S. MILIUS

More controversy, please

"Nobel prizes go to scientists harnessing odd phenomena" (*SN: 10/11/03, p. 229*) didn't include even a hint about the controversy about the Nobel Prize in Physiology or Medicine. Many people believe that Raymond Damadian should have gotten at least a share in the prize. Damadian saw and demonstrated the potential for using MRI as a medical-scanning technique when others found the idea laughable. **DAVID L. BUMP**, FLUSHING, MICH.

Evolution resolution

The article "Visionary Research: Scientists delve into the evolution of color vision in primates" (*SN: 10/11/03, p. 234*) states that "trichromacy originally evolved for picking out the most nutritious leaves." I teach high school students to avoid this kind of statement in regard to evolution. The trait arose by accident (nicely explained in the article) and then became more abundant in the population because it conferred an advantage on the organisms that possessed it (natural selection). I know that's a lot to say, but my experience in teaching evolution has shown me that misunderstandings in this area run deep.

WILL WARREN, COLCHESTER HIGH SCHOOL, COLCHESTER, VT.

Web site woes

We appreciate the patience of our readers who have experienced difficulties recently accessing Science News Online. A serious hacker attack damaged the files on our main server, and another attack has flooded our back-up server with requests, intermittently interrupting normal operation. We are working to correct the problem and regret the inconvenience that it may have caused you. — JULIE ANN MILLER, EDITOR