

SCIENCE NEWS

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deuterium conundrum
macaques that mimic
amazon forests to farmland
older dads and autism

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**beauty
or beast?**

SCIENCE NEWS

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Cover The red lionfish, an emigrant from Asia, has begun breeding in U.S. waters. Government biologists are concerned because new lab studies suggest that these beautiful aliens—popular in the aquarium trade—could spell big trouble for native species. (Corbis) Page 168

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SCIENCE NEWS

This Week

Copypat Monkeys

Macaque babies ape adults' facial feats

Scientists for the first time have established that for a brief period after birth, baby monkeys imitate facial movements made by people and adult monkeys. This copycat capacity, until now observed only in human and chimpanzee infants, seems to have evolved in all these primates as a way to jump-start newborns' face-to-face communication with adults, say evolutionary biologist Pier F. Ferrari of the University of Parma in Italy and his colleagues.

Between 3 and 7 days after birth, macaque babies smacked their lips and stuck out their tongues just as an experimenter did, the researchers report in the September *PLoS Biology*. Adult macaques make these facial gestures during friendly or cooperative interactions, such as mutual grooming.

The baby monkeys stared impassively when experimenters opened and closed their mouths or right hands. A rotating, colored disk about the size of a face also elicited no reaction.

Preliminary observations of free-ranging macaques by Ferrari's group further suggest that newborns mimic their mothers' lip smacking and tongue protrusion.

"I think that [infant] imitation developed in species in which face-to-face communication predominates over other channels of communication," Ferrari says.

Researchers have generally held that imitation in the service of social learning occurs only in people and apes. Ferrari's team questioned that assumption after the recent discovery in macaque brains of mirror neurons. These cells, also found in people, vigorously react both when an individual performs an action and when he or she watches it being executed by another (SN: 5/24/03, p. 330).

The scientists tested 21 baby macaques at 1, 3, 7, 14, and 30 days after birth. In each session, an experimenter held an infant monkey at face level and briefly exhibited a neu-

tral expression. A random series of displays then followed, consisting of tongue protrusion, mouth opening, lip smacking, hand opening, and disk spinning, each separated by a return of the neutral expression.

Many day-old infants smacked their lips frequently after viewing a mouth opening and closing, but they didn't mimic what they had seen.

Of 16 macaque babies tested when 3 days old, 13 copied tongue protrusions, lip smacking, or both. By day 7, imitation of the experimenter had largely disappeared except for continued mimicry of lip smacking by 4 animals. By day 14, all imitation had stopped.

It's not clear why some babies, whether macaque, chimp, or human, fail to imitate facial gestures, Ferrari says. His team plans to track the monkeys into adulthood to see whether the imitators and the others later differ in temperamental or sensory traits. The team will also examine whether infant monkeys that imitate develop any special social or cognitive abilities later on.



SAME TO YOU After an experimenter sticks his tongue out at a 3-day-old macaque (top), the monkey returns the favor.

In contrast to macaques, human and chimp babies typically begin mimicry at 2 to 3 weeks of age and continue for several months, as infants become emotionally tuned to their mothers. Macaque imitation occurs in a briefer time span because these primates grow up and gravitate into a social network much faster than people or apes do, Ferrari surmises.

Psychologist Kim A. Bard of the University of Portsmouth in England calls the new report "simply a terrific study." Investigators can now determine in various monkey species whether the first week of life rep-

resents a critical period for learning via imitation, says Bard, who has studied imitation among chimp infants.

"We have not yet tapped the full extent of imitative abilities in nonhuman primates," she says. —B. BOWER

Genes as Pollutants

Tracking drug-resistant DNA in the environment

A study that traces antibiotic-resistance genes in the environment indicates that they are present even in treated drinking water. The researchers behind the work and other scientists assert that the genes should be considered environmental contaminants and advocate environmental-engineering approaches toward limiting the spread of drug resistance.

In recent decades, overprescribing of antibiotics and widespread application of the drugs to farm animals have increased microbial resistance. The resistant microbes spread through human and farm populations. The antibiotics end up in human and animal waste and can reach the environment, where resistance can also develop in soil- and water-dwelling bacteria. These bacteria might then transfer the resistance genes to microbes that affect people.

The genes that enable bacteria to resist antibiotics, for instance by expelling the drugs, can be exchanged between microbes in several ways. Amy Pruden, an environmental engineer at Colorado State University in Fort Collins, notes that bacteria may also pick up free DNA.

Pruden and her colleagues decided to track the spread of antibiotic-resistance genes through an environment. The team used a method that would detect specific DNA sequences, whether from bacterial cells or their surroundings.

The researchers took sediment samples at five locations along the Cache la Poudre River in Colorado, beginning at its origin in the Rocky Mountains and continuing east to downstream sites in agricultural and urban areas. They also sampled water from irrigation ditches and waste-collection lagoons on dairy farms near the river. All the samples were then tested for four genes known to make bacteria resistant to the antibiotics tetracycline or sulfonamide.

The highest concentrations of three of the genes turned up in dairy-lagoon water, followed by irrigation-ditch water and then river sediments near agricultural and urban areas. That pattern suggests a pathway of resistance genes moving from the lagoons, through the ditches, and into the river, say the researchers.

In separate tests, the team also found two genes that carry resistance to tetracycline in Colorado drinking water and recycled wastewater. Current methods of treating drinking water aren't getting rid of the genes, says Pruden.

"I think we need environmental scientists and engineers on board, looking at this problem," she says. "Maybe there are simple ways we can modify wastewater-treatment plants or simple things farmers can do with their lagoons."

The team reports its findings in an upcoming *Environmental Science & Technology*.

Pedro J. Alvarez, an environmental engineer at Rice University in Houston, calls the work "very important." The discovery of antibiotic-resistance genes in drinking water demonstrates the "ubiquitous nature of the problem," he says.

By viewing antibiotic-resistance genes as pollutants, "we can begin to consider environmental-engineering solutions," Alvarez adds. —A. CUNNINGHAM

Problem Paternity

Older men seem more apt to have autistic kids

Children born to fathers who are age 40 or older have an increased risk of developing autism, a new study suggests.

Autism is marked by poor verbal skills, repetitive behavior patterns, and social detachment. It shows a hereditary component; someone with an autistic sibling has an increased risk of being autistic. But no single gene mutation or alteration appears to explain most cases of the disease. "There are probably many genes that might contribute to it," says Abraham Reichenberg, a neuropsychologist at Mount Sinai School of Medicine in New York City.

The incidence of autism rose roughly tenfold in the United States between 1975 and 1995. While some of the increase might have resulted from greater awareness and diagnosis of the condition, scientists have sought other explanations. Some have focused on paternal age, which appears to be increasing in industrialized countries.

Reichenberg and his colleagues tapped into a database of Israeli young people, who are required to register with a draft board at age 17. Records of more than 300,000

youths revealed that children fathered by men age 40 or older were nearly six times as likely to be autistic as those with fathers under 30. In a separate calculation, the team found that fathers in their 30s were no more likely than younger men to have autistic children. The findings appear in the September *Archives of General Psychiatry*. Previous studies attempting to link advanced paternal age to autism risk had shown mixed results.

Scientists are speculating about how advanced paternal age might impart autism risk. The fault could lie in genetic changes that accumulate in a man's sperm-producing cells as they regenerate over the years, Reichenberg says. "These are spontaneous mutations in the germ line, and they just stay there," he says. An older man would have more mutations that might lead to autism to pass on to his children.

Another proposed explanation evokes gene imprinting. Children get two copies of every gene, one apiece from the mother and father. Some genes arrive from a parent with chemical groups—or imprints—that influence whether that copy will be activated or silenced in the offspring. Studies have linked a loss of imprinting to some diseases, including cancer.

It isn't known whether paternal age disrupts this system of imprinting, but some imprinted genes play a role in brain development, says behavioral geneticist Lawrence Wilkinson of Cardiff University in Wales. "Abnormalities in genomic imprinting could lead to abnormal gene [activation] in the brain—perhaps during critical stages of development—that could increase the risk for autism," he says.

A third possibility rests on past reports

that parents of some autistic children are themselves prone to social awkwardness, potentially reflecting autism's genetic underpinnings. "We and others wonder if, in families with autism, there might be [others] with problems of social interaction, or speech problems, or shyness," says Richard Schroer, a geneticist and pediatrician at the Florence, S.C., branch of the Greenwood Genetic Center, a nonprofit research-and-diagnostic institute. The connection found in this study, he says, "might be that some men, because of social-interaction problems, may have taken longer to marry and to have children." —N. SEPPA

Size Matters

Biosensors behave oddly when very small

Physicists have built tiny instruments sensitive enough to detect single molecules of DNA, and the construction of these sensors generally follows a simple rule: the smaller the better. However, this rule might have a limit, a new study finds.

Scientists have used microsensors to detect lone viruses, and some researchers have proposed using them to screen for HIV and cancer-indicating proteins (*SN*: 10/13/01, p. 237). The common assumption is that even smaller sensors could detect such particles more precisely.

Now, a team of researchers at Purdue University in West Lafayette, Ind., has discovered that nanosize sensors display different properties than larger ones. This unusual behavior could keep scientists from

detecting viruses and molecules efficiently, says team member Rashid Bashir.

"As you go smaller, you have to be careful of other effects that start to come into play," he cautions.

Bashir and his colleagues built several tiny silicon detectors called cantilevers, which resemble miniature diving boards that quiver slightly even at rest. The team coated the cantilevers with antibodies that attract a certain virus but not other microparticles. When a particle such as a virus attaches to a cantilever, the board's vibration decreases enough that researchers can detect the event.

The team built cantilevers of varying lengths and 30 or so nanometers thick—much thinner and smaller than sensors used in previous tests, says study leader Amit K. Gupta, now at Harvard Medical School in Boston.

He and his colleagues measured the vibrations of the nanocantilevers before and after the team added antibodies. The nanocantilevers sometimes increased in vibration after being coated, which is the opposite of what the researchers had expected, they report in the Sept. 5 *Proceedings of the National Academy of Sciences*.

Scientists had assumed that antibodies coat a cantilever evenly. But when the researchers covered their nanosensors with fluorescently labeled antibodies, they found that the proteins clustered in patterns depending on the length of the cantilevers. On the longer sensors, the antibodies bunched up at the free end of the diving-board structure.

Some of these bunches were almost as thick as the cantilevers themselves, and the researchers conclude that this caused the unexpected vibration.

"This doesn't preclude [nanocantilevers] from being used for sensing, but you have to be aware of this fact," says Gupta. He suggests several ways in which future designs might take this factor into account.

In the thicker cantilevers used previously, an uneven antibody layer wouldn't have had a detectable effect on vibration, Bashir says.

The idea that proteins collect toward the end of a nanocantilever is intriguing, says physicist Harold Craighead of Cornell University. But he finds it "not at all surprising" that layers of antibodies that are thick relative to the sensor would alter its vibrations. —E. JAFFE

On the Rise

Siberian lakes: Major sources of methane

Recent warming in Siberia is liberating carbon that had been locked in the permafrost for millennia. Consequently, Siberian lakes

are making a surprisingly large contribution to atmospheric methane, a planet-warming greenhouse gas, according to a new analysis of the methane bubbling from those lakes.

Previous studies had suggested that most northern Siberian lakes sit atop permafrost containing rich soil. Methane-making microbes in the oxygen-poor lake-bottom sediments render the lakes major methane sources, says Katey M. Walter, an ecologist at the University of Alaska in Fairbanks.

Researchers had assumed that most methane from a northern Siberian lake emanated at the same rate from all points on the lake's surface, says Walter. However, in winter field studies, she and her colleagues noted large volumes of methane gas trapped below surface ice. These gas bubbles supplement the even diffusion.

Earlier studies of lakes in the region had noted bubbles of methane but hadn't considered them important, says Walter.



BUBBLING UP Bacteria living in the sediments of Siberian lakes produce unexpectedly large quantities of methane, shown here trapped in winter ice. Glove at bottom left gives scale.

After identifying several locations where methane bubbles accumulated in the winter, Walter and her colleagues deployed underwater bubble traps to measure the gas produced. They found that over the course of a year, these locations were releasing about 20 times as much methane as was lakewide diffusion.

The new finding boosts the total estimate of annual methane emissions from all northern Siberian lakes to 3.8 million metric tons, an increase of as much as 63 percent over past estimates, the researchers report in the Sept. 7 *Nature*.

"It's remarkable that methane bubbles from the lakes with such high intensity," says John Hobbie, an ecosystem scientist at the Marine Biological Laboratory in Woods Hole, Mass.

One factor contributing to that intensity is climate warming in northern Siberia between 1974 and 2000, says Walter. Dur-

ing that period, large amounts of carbon-rich permafrost melted, which made the lakes expand to cover about 14 percent more area. That expansion alone has boosted methane emissions in the region about 58 percent, suggests the researchers' model of methane emissions.

Walter and her colleagues observed that most of the methane arose from the lake bottom within 15 meters of shore. So, the gas probably comes from sediment-dwelling microbes feasting on organic material that had recently eroded into the expanding lakes. Carbon dating of the methane indicates that the organic material had been locked away for 20,000 to 40,000 years.

About 500 billion metric tons of carbon remain locked in the permafrost soils of northern Siberia, says Ted Schuur, an ecologist at the University of Florida in Gainesville. That's almost two-thirds of the amount now wafting around Earth's atmosphere as carbon dioxide, methane, and other planet-warming gases, he notes.

Walter says that as the warming expected in coming decades makes lakes expand further and permafrost melt even more, microbes could release as much as one-third of northern Siberia's carbon in planet-heating methane. "It's a [climate] time bomb waiting to go off," she says. —S. PERKINS

Hey, Roach Babe

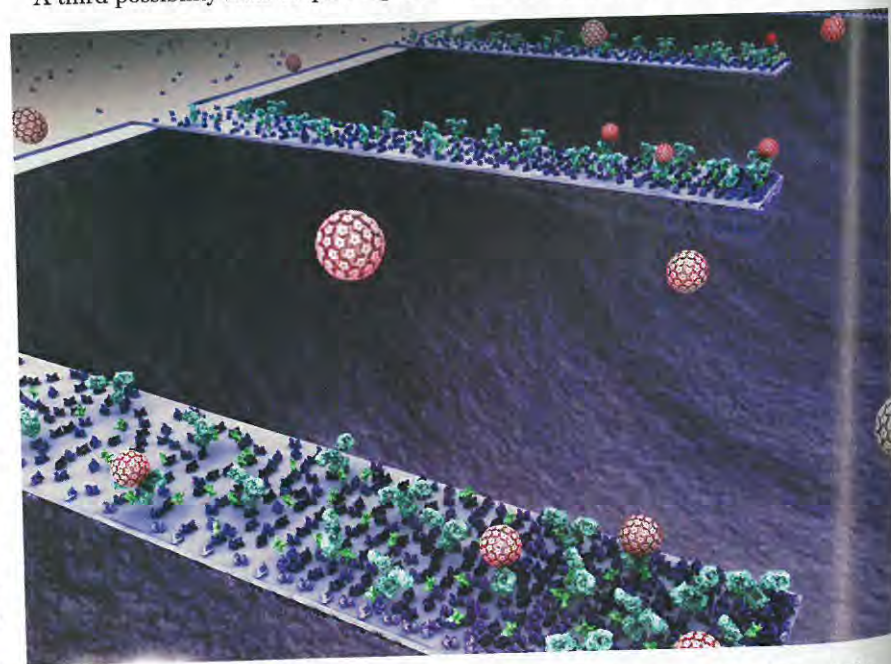
Male cockroaches give fancy courting whistles

Some male cockroaches whistle at females with surprisingly complex, almost birdlike sounds that vibrate through the ground and the air, researchers find.

Males of one of Madagascar's less-studied hissing-roach species, *Elliptorhina chopardi*, hiss loudly at the other guys and at predators. When courting females, though, the males make soft sounds, including whistles. For the most dramatic one, each male uses two voices simultaneously, like some singing birds, Jérôme Sueur and Thierry Aubin based at the University of Paris XI-Orsay note in an upcoming *Naturwissenschaften*. Under laboratory observation, males that didn't whistle were spurned by females.

The newly recorded male roaches' sounds are "very complex," agrees Allen J. Moore of the University of Exeter in Penryn, England, who has analyzed airborne sounds from a different hissing roach. Hissing cockroaches are among the very few insects that communicate with a breath-powered voice as birds and mammals do, he says.

The majority of insect sounds—chirps, trills, and skritches, as well as the squeaks



TINY CONCERN Antibodies, depicted in green and blue, bunch up toward the free end of a nanosize cantilever instead of coating the sensor evenly. Viruses, shown in red in this illustration, would therefore collect at that end of a nanosensor and might yield incorrect readings.

of other roaches—are produced by body parts rubbing together. The hissing roaches instead squirt air out of specialized holes in their abdomens. Although both male and female roaches hiss loudly at a person who picks them up, in courtship, the males are “whispering sweet nothings,” says Moore.

Sound receptors haven't been investigated yet for *E. chopardi*, which are smaller than the giant hissing roaches available in pet shops. Other researchers have found that organs beneath the knee on each leg of some roach species pick up both air- and substrate-borne vibrations below 5 kilohertz. However, the most elaborate parts of the whistles reach frequencies above that range.

Sueur and Aubin's experiment expands on work from the early 1980s that reported remarkably complicated sounds produced by *E. chopardi*.

Sueur focused on the quieter part of the male-roach repertoire. He put a male and female together on a piece of wood under dim red light and watched for 2 hours as the male attempted to persuade the female to mate. He recorded both sounds in the air and vibrations traveling through the wood under the roaches' feet. Sueur says that the platform vibrations may be important if the roaches do indeed perceive them with “ears” in their legs.

Sueur's substrate-vibration recordings are likely the first ever made for hissing roaches, says Moore.

Sueur and Aubin divided the recordings into hisses, noisy whistles with lots of static-like fuzz, and relatively pure whistles with bands of sometimes-crisscrossing frequen-



LOVE SONGS While courting a female, a male *Elliptorhina chopardi* expels air through holes in his abdomen to make soft, enticing whistles.

cies from two voices. If males didn't give the latter whistle, they didn't copulate, Sueur says.

Work by Margaret Nelson of Ithaca, N.Y., published in the 1980s, showed that male giant hissing cockroaches must make specific sounds to mate successfully. —S. MILIUS

Plowing Down the Amazon

Satellites reveal conversion of forest to farmland

The clearing of jungle to create cropland is a major and previously underappreciated force behind deforestation of the Amazon region of Brazil, according to an analysis of satellite images. The practice accounts for about one-sixth of recent forest loss in the region.

Most conservationists had assumed that new crop fields in the Amazon region usually spring up on former pasturelands.

The new findings suggest that the international demand for soybeans and other Brazilian crops is driving industrialized farming operations to clear-cut and cultivate large tracts of virgin forest.

A previous study estimated that two-fifths of the country's existing jungle may disappear by 2050 (*SN*: 4/8/06, p. 221).

While forest clearance for new farmland appears to be on the rise, the top driver of Amazon deforestation continues to be conversion of forest to cattle pasture. New grazing lands accounted for slightly more than half of lost forest area during the study, which lasted from 2001 to 2004.

“There's been debate about whether the increase in cropland in Brazil has occurred on already-cleared lands, or whether [expansion of] cropland is leading to new deforestation,” says Ruth S. DeFries of the University of Maryland at College Park.

She and her colleagues analyzed 4 years of satellite images of the Brazilian state of Mato Grosso, where most of Brazil's export crops grow and where deforestation is occurring most rapidly.

The team studied seasonal variations in the greenness of plots of land and, by visiting certain sites, linked the color patterns to forms of land use. Cropland is intensely green during the summer growing season and brown during the winter, while forest is green throughout the year, DeFries says. Pastures tend to show limited seasonal changes and are, on average, less green than forests.

On the basis of the team's readings, cropland expansion accounted for more than 5,400 square kilometers of lost forest during the study. The extent of loss ranged from 785

to 2,150 km² per year. Those annual losses correlated with each year's average soybean price, and both variables peaked in 2003. The market value of soybeans recently dipped, and deforestation declined, but a recovery could accelerate deforestation, the researchers suggest in an upcoming *Proceedings of the National Academy of Sciences*.

On average, says DeFries, “the size of the clearings used for cropland is about twice as large as the size of the clearings used for pasture.” Large clearings tend to fragment forest into small chunks that could isolate vulnerable species, she says.

Brazil's government has been monitoring the rate of Amazon deforestation since 1988, but it hasn't had an efficient method for gauging the subsequent use of cleared forest areas, says Carlos M. Souza Jr., a geographer at the Amazon Institute for People and the Environment in Belém, Brazil. The new study demonstrates such a method, he says, which “allows us to track land use after deforestation.” —B. HARDER



Rare Uranian eclipse

The Hubble Space Telescope has for the first time recorded an eclipse on Uranus. The white dot is Uranus' moon Ariel, which is 1,120 kilometers wide. By blocking the sun, it casts a shadow (black dot to right) on the planet's cloud tops. Although eclipses frequently occur on Jupiter and Saturn, Uranus rotates tipped on its side, so the sun alternately shines on one pole or the other during the planet's 84-year orbit. Because the moons of Uranus orbit at the planet's equator, the sun seldom illuminates them directly. During the last equinox on Uranus, in 1965, no telescope was sharp enough to record an eclipse. As Uranus approaches its 2007 equinox, astronomers expect Hubble's sharp eye to record many more eclipses by the planet's retinue of satellites. —R. COWEN

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BAD-NEWS BEAUTIES

Poison-spined fish from Asia have invaded U.S. waters

BY JANET RALOFF

With striking red, black, and white stripes decorating its body, fins, and some dozen spines along its head, back, and sides, the red lionfish is at once beautiful and frightening. The football-shaped fish can grow up to 18 inches long and is poisonous to the touch. At smaller sizes, this subtropical fish from Asia is extremely popular for hobbyists with saltwater aquariums, but the red lionfish is a major worry to government biologists charged with protecting native species in the wild.

In the past decade or so, the lionfish has increasingly shown up along the U.S. coast from North Carolina to Florida, where it could spell big trouble for the domestic fish whose ranges it's invading.

There are several scenarios by which this fish could have entered the coastal waters. Many biologists point to Hurricane Andrew in 1992 as the agent behind the first release. Its destruction included an aquarium that had housed six red lionfish in a Miami home on Biscayne Bay. Several of the vividly striped survivors were spotted in the bay shortly thereafter.

Red lionfish were swimming freely along the U.S. coast long before that, says Walter R. Courtenay, a fisheries biologist at the U.S. Geological Survey in Gainesville, Fla. He proposes as the earliest North American sighting a red lionfish that an oceanographer identified during the mid-1980s after it was caught from a pier in Lake Worth, Fla.

There could have been several lionfish releases, at least some of them deliberate, biologists now suspect. For instance, hobbyists might have released pet lionfish that had outgrown their aquariums. Another possibility is that dive-boat operators may have released red lionfish, perhaps purchased at a pet store, to establish a population for their customers to observe. Courtenay notes that several excursion operators brag that they can take tourists to see red lionfish, a species that scientists can have trouble locating in the sea.

The biologists generally rule out ships' ballast tanks, which have carried many other species that became invaders once they were released far from their native waters. Few tankers and freighters

come to the southeastern United States from the red lionfish's native range in the South Pacific, Indian Ocean, and Red Sea.

Regardless of when or how red lionfish got their start in the Western Hemisphere, the fish have become well established. New research indicates that they're breeding, growing faster than they do in their home range, and proving unappetizing to would-be predators. The latest reports indicate that the species has now spread to Bermuda and the Bahamas.

EVER BOLD Few know the red lionfish (*Pterois volitans*) as well as Lev Fishelson does. For more than 40 years, this marine biologist at Tel Aviv University in Israel has studied the species in the Red Sea, the westernmost portion of its native range. What have always struck him about the fish are its grace and "fearlessness."

Unlike most reef denizens, red lionfish will approach divers rather than veer away. Fishelson warns that the animal will sometimes launch itself into a person. If the needlelike tip of a spine breaks the diver's skin, he or she will experience intense pain and swelling at the wound site and usually end up in the hospital, says Fishelson.

A member of the scorpionfish family, this lionfish has a reservoir of venom at the base of each of its spines. If the spine is pushed inward, the pressure on the venom gland triggers toxin to shoot up the hollow spine to its tip, explains reef biologist H. Scott Meister of the South Carolina Department of Natural Resources in Charleston.

Because the process is entirely mechanical, he adds, handling even a dead red lionfish can release its venom.

While keeping a polite distance, Fishelson has had the rare privilege of witnessing the red lionfish's courtship. Initially, he reports, the normally solitary animals begin collecting into groups of more than a dozen. For 3 to 4 days, males will posture before prospective mates. This entails darting forward and thrusting spines atop its head at a rival.

When adequately impressed, a female will join her suitor and commence a spawning dance. Face-to-face, they'll circle just above the seafloor. Eventually, the couple will slowly ascend the water column, continuing its waltz. Just before reaching the surface, the female will expel a mucus ball, containing thousands of eggs, which floats to the surface. Her companion, Fishelson says, responds by turning belly up and releasing a cloud of sperm into the egg ball.



BOLD AND COLORFUL — Unlike native reef fish, these red lionfish photographed 50 miles east of North Carolina quickly grow large enough to prey on other fish. Meanwhile, would-be predators find them unappetizing.

Then, as if the music were over, the dancers suddenly go their separate ways.

Within a day, at least in the Red Sea, Fishelson says, those eggs will have hatched into larvae and migrated to hideouts among the algae growing on the seafloor. Three months later, they are miniature versions of the parents.

TANKED Although previously spotted in Florida, red lionfish hadn't been sighted off North Carolina until 6 years ago. Just 2 years later, in 2004, National Oceanic and Atmospheric Administration (NOAA) researchers in North Carolina reported the first evidence that the species was reproducing along the U.S. coastline. That finding all but ruled out the prospect of eliminating the immigrants, the scientists say.

NOAA has since launched a program aimed at evaluating whether the invader poses any risk to commercially important, native western-Atlantic fish. Little research had been published on the red lionfish, so the biologists had to first describe the fish's life-cycle, diet, and likely predators. Last May, the researchers presented many of their preliminary findings at the International Conference on Aquatic Invasive Species in Key Biscayne, Fla.

"The interesting thing about invasive species is that it's not uncommon for them to actually get bigger or do better in a new habitat" than in their native range, says Paula Whitfield of NOAA's lab in Beaufort, N.C. From all accounts, individual red lionfish off the Carolinas are growing much faster than native fish do. The phenomenon may reflect more food for the fish, fewer predators, or accommodations nicer than home in other ways.

Although baby red lionfish have been seen in late summer or fall as far north as Long Island, N.Y., Whitfield says that these fish can't survive the winter there. In her lab, the species dies when the water temperature drops below 10°C (50°F).

However, 20 miles east of Cape Hatteras, N.C., at depths of 100 to 160 feet, temperatures would remain hospitable to red lionfish year round. Sampling 27 sites there during a recent scouting expedition, her group found red lionfish at every location except one. The team is now examining the 150 specimens that it collected.

Jennifer Potts, also of NOAA's Beaufort lab, is figuring out how old individual fish are. She has examined calcium deposits, called otoliths, in their ears. The deposits add layers, like tree rings, as a fish ages. "What I've found—and this is very preliminary—is that my oldest fish appears to be 7 years old," she says. That fish is 17 inches long.

Other fish that she estimates at 2 years old are already 10 inches long, she adds. Examinations of gonads from wild fish have indicated that individuals of this species are sexually mature by the time they're 7 or 8 inches long.

Indeed, among the 130 red lionfish collected last month during a 9-day cruise off the Carolinas, James A. Morris Jr. of NOAA's Beaufort lab found indications that yearling females were already spawning.

A mature female may release a pair of egg balls about five times each month "from spring to fall off of North Carolina, and possibly year-round off of Florida," notes Morris.

Red lionfish could have a selective advantage over native fish



EGGED ON — This close-up shows some of the 15,000 eggs in a typical lionfish egg ball. A pinkish stalk (arrow) delivers blood to each egg, helping it mature quickly. This is the first report of that structure in this species.

Lion or Peacock?

Unusual tentacles are becoming more common among juveniles

The typical juvenile red lionfish has fleshy, striped, spear-shaped tentacles protruding from its head behind the eyes. However, beginning some 40 years ago, Lev Fishelson of Tel Aviv University occasionally found immature members of the

Red Sea population that were sporting fringed or feather-shaped tentacles that were emblazoned with eyelike dots. "They look like peacock feathers," he notes.

In recent years, the frequency of lionfish with the variant tentacles has been increasing—to about 10 percent of juveniles. Fishelson described the evolution of this trait in the March *Environmental Biology of Fishes*.

After reading that report, James A. Morris Jr. of the National Oceanic and Atmospheric Administration looked for the peacock variant among the 130 red lionfish that his team picked up last month during a cruise off the Carolinas. Among these fish, some 25 percent of juveniles sported the variant tentacles. "So, we're seeing a higher prevalence of these peacock tentacles in the Atlantic than Fishelson has reported finding in the Middle East," Morris says.

A fish's peacock tentacles send a signal to some other animal, Fishelson told *Science News*. For instance, the small dots may look to another fish like tiny prey and might lure it to within striking distance of the juvenile lionfish, which has a huge mouth. Fishelson argues that the new trait's increasing frequency suggests that it offers its hosts some as-yet-unrecognized benefit. —J.R.



EYES HAVE IT — These peacock tentacles come from a juvenile lionfish caught this summer off North Carolina. Note their broad, fan-blade shape, with a fringed midsection, and eyelike dots in the upper region. Normally, tentacles are striped, spearlike protrusions.

along U.S. reefs. Not only would the lionfish quickly become too big for many medium-size fish to eat but they would also start preying at a young age on those fish, Potts says.

Morris finds that native fish don't seem much interested in eating even tiny red lionfish. This past June, for instance, he offered a 2-inch-long red lionfish and a similar-size native reef fish to 1-foot-long black sea bass. In 20 trials, the bass ate every native fish but, in 16 of those tests, it shunned young red lionfish. Sometimes, a bass took a red lionfish into its mouth, but it usually spit out the small fish.

WHAT'S FOR DINNER? In the waters off South Carolina 4 years ago, biologists noticed lionfish specimens around 7 inches long, says David M. Wyanski of the South Carolina Department of Natural Resources. Now, red lionfish encountered there can be 17 inches long and weigh 3 pounds.

What are they eating to grow so robustly? Roldan C. Muñoz at NOAA's Beaufort facility has examined the mouth and stom-

ach contents of 88 red lionfish captured in the Atlantic Ocean. Muñoz found that these lionfish had been eating the occasional sea urchin, brittle star, crab, shrimp, and mollusk. However, 97 percent of the lionfish diet had been other fish, especially small sea bass and parrotfish.

Although Muñoz didn't find evidence that lionfish were dining on groupers or snappers, which like bass are commercially important fish, the invaders may still threaten those populations. Native groupers off the Carolinas eat black sea bass and parrotfish, Muñoz notes, as the red lionfish do.

Meanwhile, red lionfish may soon end up on some people's dinner plates. Wyanski points out that this year those fish were caught in such quantity that boat operators along the Carolinas started including them in boxes of "mixed catch" sold skinned and sometimes filleted to consumers at a discounted price. The toxin from red lionfish poison glands doesn't taint the meat, he says.

WHAT NOW? Recently, NOAA scientists began genetic studies of red lionfish to determine how many separate releases in the Atlantic have occurred. Whitfield says that her team is finding evidence of a "severe genetic bottleneck," suggesting that perhaps no more than three pregnant females launched the expanding western-Atlantic red lionfish population. The data point out, says Whitfield, how large an impact the introduction of even a few aliens can have.

The evidence is strong that the red lionfish and similar invaders

came from the aquarium trade, says Brice X. Semmens of the University of Washington in Seattle. He and his colleagues found that the 16 nonnative fish—including red lionfish—most often seen by divers in the Atlantic Ocean off Florida are all common saltwater-aquarium species that probably moved into that state for the hobbyist trade. There's little ship traffic between the southeastern United States and the native waters of any of those species.

Additional data also point to the aquarium industry as the culprit. In the first 6 months of 2003, for instance, more than 7,500 red lionfish were imported into Tampa, according to Whitfield and a team of scientists at the Florida Fish and Wildlife Research Institute in St. Petersburg. They reported in the March *Biological Conservation* that this species is among the top 10 saltwater fish, in terms of profitability, to the U.S. aquarium industry.

Three years ago, Whitfield and Jonathan A. Hare, also of NOAA, prepared a report on red lionfish for their agency. In it, they argued that the aquarium industry "should be urged or required to distribute information warning against releasing

live fish from aquariums." Government agencies might also consider banning the importation of live, nonnative fish—something that Bermuda now does.

In the meantime, Meister jokingly suggests a transitional strategy: recruiting coastal chefs to develop recipes for red lionfish. Everyone knows that "as soon as a fish tastes good, there's a market for it"—and soon, he quips, you see it fished to oblivion. ■



RAPIDLY MATURING — These immature lionfish, collected as babies in the Philippines, are about 6 inches long and approaching 2 years old. In U.S. waters, however, lionfish appear to reach maturity when they're 1 year old.

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SCIENCE NEWS

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QC2 headphones (left).
New QC3 headphones (right).



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TOO MUCH DEUTERIUM?

A chemical mystery in the Milky Way

BY RON COWEN

A new study appears to solve a 35-year-old puzzle among astronomers about the distribution of an isotope forged just after the Big Bang, but it poses new questions about the ways in which stars form in the Milky Way and how the galaxy was built.

Deuterium is a heavy isotope of hydrogen. Because stars consume large amounts of it and no process creates it in significant amounts, the amount of deuterium in the universe declines steadily. The deuterium abundance in the Milky Way is therefore an indicator of how much star formation has occurred over the 12 to 13 billion years since the galaxy's birth.

UPS AND DOWNS Observations in the 1970s with the Copernicus satellite revealed that deuterium concentrations vary widely across the Milky Way. That finding surprised astronomers who had figured that deuterium should be as evenly spread across the galaxy as normal hydrogen and other light elements are. Many researchers ascribed the data to errors in measurements. But a new analysis of measurements recorded by NASA's Far Ultraviolet Explorer Satellite (FUSE) over the past 6 years confirms the perplexing result. The findings also offer a possible explanation.

According to astronomers working with the FUSE data, the deuterium abundance along different sight lines from Earth varies between 5 and 23 parts per million (ppm) in the galaxy. Moreover, these concentrations are inversely correlated with the amount of undisturbed carbon dust that a region contains. Jeff Linsky of the University of Colorado at Boulder and his colleagues describe the findings in the Aug. 20 *Astrophysical Journal*.

The results may be explained by a prediction made in 2003 by study coauthor Bruce Draine of Princeton University. He proposed that atoms of deuterium gas have more of a tendency to attach to dust grains than do atoms of normal hydrogen.

Once an atom of hydrogen or one of its isotopes binds to dust, the spectrometer at the heart of FUSE can no longer detect the element.

Draine's model also showed that supernova explosions can revaporize deuterium that had attached to dust. According to the model, FUSE observed low amounts of deuterium within 100 light-years of the sun because that region has a high abundance of carbon dust that's been undisturbed for millions of years, Linsky says.

Last year, Jason Prochaska of the University of California, Santa Cruz and his colleagues linked deuterium concentrations in the

Milky Way with the varying abundance of titanium. Nearly all titanium resides in carbon-rich dust grains, so his results are consistent with Draine's model and the FUSE data. Prochaska's team reported its findings in the Feb. 10, 2005 *Astrophysical Journal Letters*.

The studies make a compelling case that dust causes the variations in deuterium concentrations, says astrophysicist Max Pettini of the University of Cambridge in England. Monica Tosi of the INAF-Astronomical Observatory in Bologna, Italy, agrees.

IN THE CLEAR If dust hides some deuterium, then the truest reading of the isotope's galaxywide concentration is the highest one, which would come from dust-free areas, Linsky asserts.

Therein lies a problem. The highest concentration in the galaxy—23 ppm—is uncomfortably close to the primordial value of 27 ppm, derived from several lines of evidence. If those values are correct, all the stars that have ever formed in the Milky Way would have consumed only 15 percent of the original deuterium.

Yet several models maintain that stars have gobbled up 30 to 40 percent of the initial allotment. New calculations from Tosi's team in the mid-June *Monthly Notices of the Royal Astronomical Society* support that percentage.

Taken at face value, the abundance of deuterium proposed by Linsky and his colleagues indicates that either the primordial deuterium abundance was higher than scientists have inferred or there's something missing from current ideas of how stars form and consume deuterium. The new value is also at odds with well-established correlations between deuterium and measured abundances of other elements in stars and the gases between them.

She and other astronomers say that they're not convinced that the maximum value of deuterium recorded by FUSE is the value throughout the galaxy. Uncertainties in the craft's measurements are relatively high, they note. Factors such as stellar and supernova winds might cause small but significant variations in deuterium readings.

Linsky suggests a way out of the dilemma: In cannibalizing nearby galaxies, perhaps the Milky Way incorporated gas richer in deuterium than its original gas.

"It is still too early to make any serious claims about chemical evolution" in the Milky Way, says Prochaska.

But it isn't too early to speculate about it, says Pettini. The report by Linsky's team is the most comprehensive study of deuterium in the Milky Way ever conducted, he says. It could prompt astronomers to reassess their view of the evolution of this isotope in the galaxy and its role as a signpost for star formation. ■



GUIDE STAR — Astronomers used a satellite to record the ultraviolet light from the hot star AE Aurigae (blue halo near center of image). From such measurements, they calculated the Milky Way's abundance of deuterium, an isotope of hydrogen forged just after the Big Bang.

OF NOTE

BIOLOGY

Stem cells sense stiffness

Stem cells can sense the texture of whatever medium they're growing on and use this quality to guide their fate, according to new research.

Unlike other cells in the body, stem cells start out with the ability to morph into many types of tissues. Scientists have proposed transplanting these cells to repair parts of the body damaged by illness or wear. However, before that scenario can play out in the clinic, researchers must learn how to tightly control what tissues stem cells become.

Dennis E. Discher of the University of Pennsylvania in Philadelphia and his colleagues had a hunch that a stem cell's fate might depend on the texture of the growth medium that researchers use to raise the cells in the lab. To test their theory, the researchers worked with a type of stem cell isolated from adult bone marrow. These mesenchymal cells have the capacity to become nerve cells, muscle, or bone.

The scientists found that growing the cells in a dish of soft gel, analogous to brain tissue, yielded nerve cells. Stem cells grown on a harder gel became muscle, and those grown on the stiffest gel became bone.

Discher's team reports in the Aug. 25 *Cell* that molecular motors inside the cells cause them to grip the medium they're on and determine its texture. —C.B.

PHYSICS

Radiant plasma may combat cavities

Here's a new way to flash a smile: Waft a glowing plasma of charged particles onto your teeth. Researchers in the Netherlands and the United States have shown that a radiant vapor made from electrically zapped helium gas quickly kills colonies of the main bacterial culprit in tooth decay.

The finding might ultimately lead to improved dental-office techniques for stopping—and possibly even reversing—early-stage decay caused by *Streptococcus mutans* or other microbes and for disinfecting hard-to-reach areas between teeth, says David R.

Drake of the University of Iowa College of Dentistry in Iowa City.

Unlike plasmas, including the sun's corona, that exist only in a vacuum and reach temperatures of thousands to millions of degrees, the newly demonstrated bactericidal plasma forms in room-temperature gas.

A handheld stylus, originally devised by Eva Stoffels of the Eindhoven (Netherlands) University of Technology, creates the plasma. Helium gas flows through a glass tube around a sharp tungsten needle. A powerful electric field at the needle's tip shatters helium atoms to create the swarm of electrically charged ions and electrons that constitute the plasma, explains physicist John Goree of the University of Iowa.

As these ions and electrons mix with air just beyond the needle tip, the speedy electrons, which cause the plasma's glow, slam into components of the helium-air mixture. The collisions generate highly reactive, short-lived products, such as lone oxygen atoms from shattered oxygen molecules, that can kill bacteria. The researchers are planning tests to verify that gums aren't damaged.

Stoffels, Drake, Goree, and physicist Bin Liu, also of University of Iowa, describe their new approach and stylus in the August *IEEE Transactions on Plasma Science*. —P.W.

BIOLOGY

High-protein diets boost hunger-taming hormone

Eating protein appears to boost blood concentrations of a hormone recently found to restrict appetite, researchers report. The findings could explain the success of popular high-protein diets.

Four years ago, Rachel L. Batterham of University College London and her colleagues found that injecting a hormone called peptide YY (PYY) into both normal-weight and obese people reduced their food intake by about a third and dampened hunger. A person's gut normally secretes the hormone during and after a meal.

Batterham's team wondered whether food's three basic nutrients—protein, carbohydrates, and fat—have different effects on how much PYY people secrete.

To find out, the researchers recruited groups of normal-weight and obese men. Each volunteer came into Batterham's lab

and ate a specially crafted meal on three days. Although the three meals tasted similar and had the same number of calories, each meal offered a proportion of calories from protein, carbohydrates, and fat.

The researchers found that blood concentrations of PYY were significantly higher in both groups of men after the high-protein meal than after meals high in carbohydrates or fat. Both groups reported higher sensations of fullness and less hunger after eating more protein.

Working with normal and obese mice, the researchers found that animals fed high-protein diets gained less

weight and made more PYY than those fed more carbohydrates or fat. However, animals genetically modified to produce no PYY gained similar amounts of weight, regardless of their diets' composition.

Batterham's team suggests in the September *Cell Metabolism* that people can harness the appetite-decreasing power of PYY simply by boosting their dietary protein. —C.B.

ENVIRONMENT

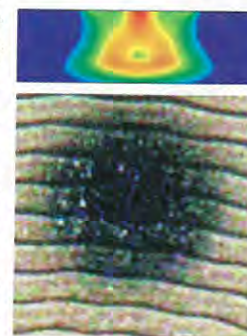
Are pollutants shrinking polar bear gonads?

The more polluted a polar bear's fat, the more likely its reproductive organs will be undersize, scientists find.

They collected gonads from 55 male and 44 female bears killed legally by subsistence hunters in east Greenland. The scientists then tested the bears' fat for pollutants that might affect sex hormones.

Especially in immature males, testis length diminished with increasing concentrations of many of these compounds, including DDT, polybrominated diphenyl ether (PBDE) flame retardants, and banned termiticides called chlordanes. The weight and length of the baculum, a bone that supports a bear's penis, also decreased significantly with increasing concentrations of some of the compounds.

Ovary length diminished with increasing PCB and chlordane concentrations, and ovary weight decreased with increasing



DEAD ON Glowing plasma, depicted in the intensity-enhanced video image (top), killed and blackened a patch of tooth-cavity-causing *Streptococcus mutans* bacteria (bottom photo).

PBDEs, the team reports an upcoming issue of *Environmental Science & Technology*.

Although studies had suggested that some of these agents might affect animals' reproduction, "this is the first time it has ever been shown outside the laboratory," says Christian Sonne of Denmark's National Environmental Research Institute in Roskilde, who led the new study.

"There's no doubt" that some of the sex-organ changes observed would impair reproduction, he says. The same pollutants might be related to the falling fertility of men in many countries (*SN*: 1/22/94, p. 56), he adds. —J.R.

BIOMEDICINE

Old drug can stop clots as well as newer drug does

A decades-old form of the anticlotting drug heparin is as safe, as effective, and potentially as convenient to use as recent derivatives that are many times as expensive.

Some people who develop blood clots deep in leg veins receive plain heparin, which can prevent subsequent, sometimes-deadly clots. Others get low-molecular-weight heparin, which comes in several varieties and is sold by various manufacturers.

Doctors usually administer the plain heparin by intravenous drip, which requires hospitalization. IV administration enables a physician to quickly adjust a patient's dose if, for example, testing suggests that the person's blood remains excessively prone to clotting.

Low-molecular-weight heparin was designed to behave more predictably in the body, thereby making monitoring unnecessary. Patients are sent home with the drug in syringes that they can use to inject themselves once or twice a day.

In the United States, a 6-day course of the newer treatment might cost \$712, compared with \$37 for standard heparin, according to researchers led by Clive Kearon of McMaster University and the Henderson Research Centre in Hamilton, Ontario. In their study, the researchers administered a fixed dose of plain heparin by syringe to half of the 708 volunteers and a low-molecular weight heparin, also by syringe, to the others. All the study participants had had recent blood clots.

Not quite 5 percent of each group developed either a new blood clot or major

bleeding during the study, Kearon's group reports in the Aug. 23/30 *Journal of the American Medical Association*.

"We just used the two drugs the same way, and we got the same result [with each]," Kearon says. "It questions this idea that the two drugs behave very differently and need to be used in different ways." —B.H.

EPIDEMIOLOGY

Herpes simplex viruses dip in prevalence

Two viruses that cause genital herpes, herpes simplex virus-1 and -2, decreased in prevalence in the United States during the past 2 decades, according to a new study by the Centers for Disease Control and Prevention in Atlanta.

Among some 9,000 people tested between 1988 and 1994, 21 percent had been exposed to HSV-2, which is the main cause of genital herpes worldwide. A similar survey conducted between 1999 and 2004 suggested that 17 percent of U.S. residents had been exposed.

Prevalence of HSV-1, which causes cold sores frequently and genital herpes occasionally, fell from 62 percent during the first study period to 57.7 percent during the second period. However, the proportion of HSV-1-infected people who reported developing genital herpes from the virus rose from 0.4 percent to 1.8 percent.

The study didn't determine the cause of the decreases in virus prevalence. —B.H.

NEUROSCIENCE

Sleep disorder tied to brain ills in kids

Children who temporarily but repeatedly stop breathing while asleep display learning problems accompanied by chemical irregularities in critical brain areas, according to a new investigation.

A team led by Ann C. Halbower of Johns Hopkins University School of Medicine in Baltimore focused on kids ages 6 to 16—most from poor, black families—with obstructive sleep apnea (OSA). Symptoms of this condition include loud snoring, interrupted sleep, constant fatigue, and concentration problems. OSA affects about 2 in 100 children.

Compared with 12 healthy youngsters free of sleep problems, 19 children diagnosed with OSA scored especially low on IQ tests and on measures of learning and word memory. Brain scans conducted on six kids in each group indicated that the children with sleep apnea had unusually low amounts of three substances produced

in the hippocampus and the frontal cortex, which are learning-related brain regions.

It's not known whether sleep apnea causes these brain problems in children or vice versa, Halbower's group notes in the August *PLoS Medicine*. It's also unclear whether administration of medication to boost the critical brain substances will ease symptoms of severe sleep apnea.

The researchers theorize that factors other than sleep apnea, including poverty and, in many cases, obesity, also contributed to neural problems in these children.

Related imaging studies have previously identified damaged or misshapen areas of the frontal cortex, hippocampus, and cerebellum in adults with sleep apnea. —B.B.

ENVIRONMENT

Plastics agent worsens skin allergies

Low doses of one of the most commonly used softeners in plastics can aggravate dust-mite allergy, researchers report.

The plasticizer di(2-ethylhexyl) phthalate (DEHP) is ubiquitous in air, water, and most people's bodies. It's in plastics used for toys, food packaging, medical products, and housewares.

A few earlier studies had correlated allergy severity with exposure to DEHP in people (*SN*: 7/24/04, p. 52). To investigate such associations, physician Hirohisa Takano of the National Institute for Environmental Studies in Tsukuba, Japan, and his colleagues repeatedly injected mice with an allergen produced by dust mites as well as with pure vegetable oil or oil laced with various doses of DEHP.

The allergen, injected into the animals' outer ears, caused swelling, skin thickening, and some wounds at the injection sites. These symptoms were moderately to dramatically worse in the animals exposed to 1-to-20-microgram doses of DEHP, compared with the reaction in mice receiving no DEHP or 100- μ g DEHP doses. Pollutants that resemble hormones, including some phthalates, can be more toxic at lower doses than at higher ones.

In this study, mice getting the lowest DEHP dose had nearly double the number of certain inflammatory white blood cells at the injection site as did mice getting pure-oil injections or the high-pollutant dose. The revved-up production of the cells, which can damage healthy tissue, paralleled higher amounts of other allergy-promoting agents in these mice.

The doses of the plasticizer given to the mice "are comparable to the recently calculated daily [human] intake," Takano's team notes in the August *Environmental Health Perspectives*. —J.R.

Books

A selection of new and notable books of scientific interest

BRAVE NEW UNIVERSE: Illuminating the Darkest Secrets of the Cosmos

PAUL HALPERN AND PAUL WESSON

As technologies for exploring space become increasingly sophisticated, answers to the deepest questions about the nature of the universe lie tantalizingly close.

Scientists have presented a new picture of the infant universe that takes into account the mysterious stuff called dark matter. That's the invisible entity that astronomers believe makes up much of the universe. Halpern and Wesson, both professors of physics, detail

the research into the mystery matter in its cold and hot forms as well as into the other big questions that challenge cosmologists today. They ponder why we haven't yet found intelligent alien life forms, and detail hypotheses about the shape of the universe. *Joseph Henry Press, 2006, 264 p., b&w plates, hardcover, \$27.95.*

THE SURVIVAL IMPERATIVE: Using Space to Protect Earth

WILLIAM E. BURROWS

Hell could arrive on Earth tomorrow morning. Burrows opens his book with a tale of massive destruction and chaos the world over. Its trigger: a cataclysmic impact from space on the scale that happens once every 2 billion years. However, Burrows, a professor of science journalism, describes not only the possibility of death from above but also increasingly likely earth-bound disasters. These include hurricanes, global warming, earthquakes, and human-made

threats such as nuclear and chemical weapons. Burrows details his belief that the U.S. space program can protect Earth from these threats and perhaps even prevent the premature eradication of human life on Earth. He explains that NASA, once a source of national pride, is today an agency without a mission. That void should be filled by an overarching mission to protect Earth, Burrows says. This protection includes active defense systems against rogue meteors and nuclear weapons as well as environmental projects such as spotting pollution with satellites and giant solar orbiting collectors. *Forge, 2006, 317 p., hardcover, \$24.95.*

THIS IS YOUR BRAIN ON MUSIC: The Science of a Human Obsession

DANIEL J. LEVITIN

There is evidence that music of one form or another has been an integral part of human culture since its beginnings. That tradition continues in all cultures, writes Levitin, a neuroscientist with a background in music production and performance. Here, he reviews the science behind many people's obsession with music, how music is able to convey and conjure up emotion, how it is processed by the

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brain, and how even the musical novice has an inherent ability to recognize musical features such as key, meter, and timbre. Levitin begins by defining



music, explaining how its pitches have remained essentially the same since the time of the Greeks and how instruments have been invented to expand available sounds. He ponders people's remarkable memory for music, an ability that can occasionally be burdensome: when you can't get that stupid jingle

out of your head. He looks at how expert musicians are different from casual listeners and considers whether musical ability is partially genetic. Music, Levitin writes, lies at the heart of human nature. *Dutton, 2006, 314 p., hardcover, \$24.95.*

MORAL MINDS: How Nature Designed Our Universal Sense of Right and Wrong

MARC D. HAUSER

Philosophers have long debated how a person develops a sense of morality. According to Hauser, the director of the cognitive-evolution laboratory at Harvard University, morality

comes hardwired in the human brain, a consequence of our evolution as social animals. Similar to our inherent capacity for language is an inherent, universal moral grammar with which we evaluate our behavior and that of others. With this sense, we have developed legal codes, religions,

and ethical standards for use in medicine, the military, and interpersonal relationships. Hauser explains how philosophers have tackled the role of emotions in exercising moral sense, and how psychologists have analyzed moral development in children. He also looks at how moral judgments, especially in regard to violent action in defense of honor, can vary across cultures. *HarperCollins, 2006, 489 p., hardcover, \$27.95.*

THE BEST AMERICAN SCIENCE WRITING 2006

ATUL GAWANDE AND JESSE COHEN, EDs.

Surgeon and writer Gawande includes a wide variety of disciplines and publications in the latest of Cohen's series of collections of the year's best sci-



ence writing. According to Gawande, the best of science writing is "cool," in that it makes scientific concepts comprehensible to scientists and nonscientists alike. Some of the best efforts, by Gawande's standards, are found not only in the science media, such as *Discover* and *Scientific American*, but also in mainstream publications such as the *New Yorker*, *Harpers*, and *Atlantic Monthly*. He has collected 21 essays with subject matter ranging from the number of planets in our solar system to the increasing threat posed by avian flu. Other essays focus on current controversies that cross the line between science and politics, such as clashes about intelligent design, the prospect of cloning endangered species, the definition of race, and the origins of homosexuality. *Harper, 2006, 362 p., paperback, \$14.95.*

LETTERS

Brother bother

If having biological older brothers correlates to homosexuality ("Gay Males' Sibling Link: Men's homosexuality tied to having older brothers," *SN*: 7/1/06, p. 3), then we would expect that in the past, when families were larger, there would be a greater proportion of homosexuals. Is there any evidence for this?

RICK NORWOOD, MOUNTAIN HOME, TENN.

The article concludes with psychologist Daryl Bem inferring that male homosexuals are less aggressive than male heterosexuals. I thought that was part of the inaccurate stereotype of male homosexuals.

JAN MCCLURE, CARDIFF, CALIF.

There's no evidence on the question of homosexuality in large families of the past. Bem was referring to childhood traits. —B. BOWER

Through a dino's eyes

"Sight for 'Saur Eyes: *T. rex* vision was among nature's best" (*SN*: 7/1/06, p. 3) makes two questionable assertions. First, *Tyrannosaurus rex* might well have had excellent binocular vision and been a predator, but still have had a handicap for the detection of motion as my cats do. Second, when Thomas R. Holtz Jr. states that binocular vision "almost certainly was a predatory adaptation," that puts us binocular hominids firmly among predators, while our dentition firmly disputes this.

HERB WINDOLF, PRESCOTT, ARIZ.

Whiff of danger?

If the estrogenic properties of lavender oil and tea tree oil are actually sufficient to produce these effects in young boys ("Lavender Revolution: Plant essences linked to enlarged breasts in boys," *SN*: 7/1/06, p. 6), could they produce potentially more serious negative impacts on women with estrogen-positive breast cancer? I know that some oncologists recommend products containing tea tree oil to help relieve problems experienced by women undergoing chemotherapy.

GEORGE E. BURGOYNE JR., NILES, MICH.

The tooth, the truth

Please check the picture in "Mexican find reveals ancient dental work" (*SN*: 7/1/06, p. 13). The teeth shown are lower teeth.

THEODORE BLINDER, HAVERTOWN, PA.

The story and caption misidentified the teeth that had been filed down 4,300 years ago. They were the bottom-front teeth, shown at left in the photo. —B. BOWER



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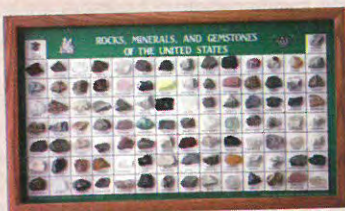
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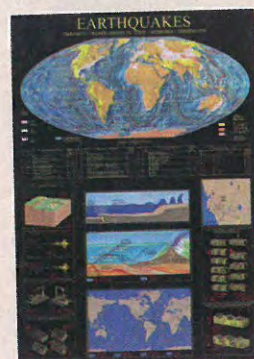


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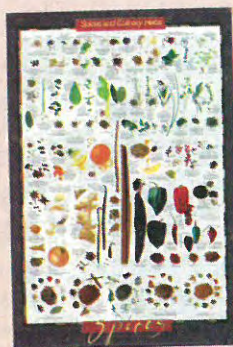
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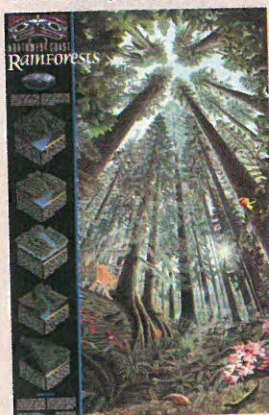


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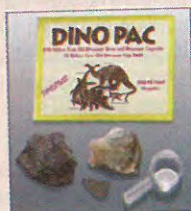


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