

# SCIENCE NEWS

THE WEEKLY NEWSMAGAZINE OF SCIENCE

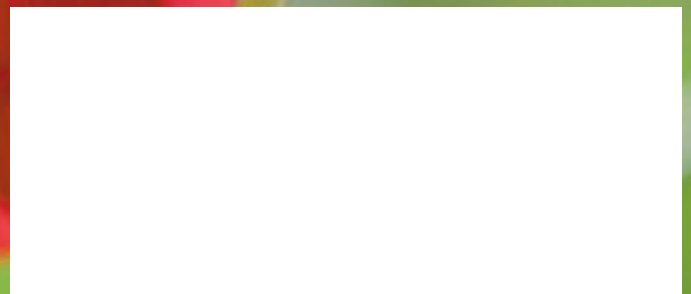
MAY 13, 2006 PAGES 289-304 VOL. 169, NO. 19

malpractice fraud rare  
monkeying with family tree  
parkinson's early signals  
jumpin' jupiter: red spot #2

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THE WEEKLY NEWSMAGAZINE OF SCIENCE

# SCIENCE NEWS

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# SCIENCE NEWS

## This Week

### Legal Debate

#### Assumptions on medical malpractice called into question

The notion that many medical-malpractice lawsuits are frivolous and intended to generate undeserved riches for plaintiffs and their lawyers isn't borne out in a new study.

A review of almost 1,500 randomly selected malpractice lawsuits in the United States finds that instances of healthy people successfully suing a doctor for malpractice are exceedingly rare and are far outnumbered by cases in which a patient injured by medical error goes uncompensated, health-policy researchers report in the May 11 *New England Journal of Medicine*.

The Boston researchers who conducted the study acknowledge that doctors pay high malpractice-insurance premiums and that litigation is expensive for all parties. But they find little to suggest that proposed federal laws limiting jury awards to patients would alleviate those costs.

The majority of payments from insurance companies went to people who had been harmed by medical errors, not to people with baseless claims, the data show. That suggests that "moves to combat frivolous litigation will have a limited effect on total costs," the authors say.

Meanwhile, federal legislation to place a \$250,000 limit on jury malpractice awards failed in the Senate this week.

In malpractice lawsuits, both sides consult physicians and other experts to bolster their cases, notes study coauthor David M. Studdert, an attorney and health-policy researcher at the Harvard School of Public Health in Boston. He and his colleagues assigned impartial doctors to review these experts' statements and the patients' medical records. Then, the reviewers assessed whether each patient was injured and whether medical errors were to blame.

In the study, about 85 percent of cases were settled out of court, and plaintiffs lost four-fifths of those that did go to trial.

The reviewers found that 97 percent of the 1,452 patients had indeed suffered harm. In about one-third of these patients, the damage wasn't clearly attributable to negligent medical treatment, a wrong prescription, or a misdiagnosis. Most of those claims were correctly denied compensation, the team reports.

Among the plaintiffs who received compensation were 6 uninjured people and 145 injured individuals whose injuries had not been convincingly linked to medical error. On the other hand, 236 plaintiffs who did suffer an injury from medical error received no compensation.

"This research shows that the problem with medical-malpractice litigation is not that too many undeserving people get paid, but rather that not enough deserving people get paid," says Tom Baker, an attorney at the University of Connecticut in Hartford.

Nevertheless, 73 percent of plaintiffs whose claims had merit received compensation, according to the study. That figure suggests that the fact-finding involved in litigation, although expensive and time-consuming, "does a pretty good job of sorting out valid from invalid claims," says Neil Vidmar, a social psychologist at Duke University in Durham, N.C. "This is as thorough a study as has ever been undertaken of these issues," he adds.

Litigating a malpractice claim through trial can take as long as 6 years.

The new findings indicate that streamlining the process would yield more savings than simply capping payouts, says Studdert. He points out that in New Zealand and some Scandinavian countries, special courts arbitrate medical disputes. —N. SEPPA

### Speed Bump

#### Tip's tricks sort DNA, write at nanoscale

Using an old tool in surprising new ways, scientists in California are making molecules race down the sloping sides of a minuscule silicon spike ordinarily reserved for poking at atoms. The novel role for the spike, which is the tip of an instrument known as an atomic-force microscope, or AFM, could lead to advances in DNA sequencing, nanofabrication of devices, and other technologies, the scientists say.

About 10 micrometers long, an AFM's tip protrudes from the end of a cantilever. Scientists usually drag it or tap it on a surface to discern an object's topography down to the atomic level (*SN*: 2/18/06, p. 101). Now, H. Kumar Wickramasinghe and his colleagues at IBM Almaden Research Center

in San Jose, Calif., have demonstrated that DNA molecules separate according to their lengths as they move along a spike's wetted surface. Moreover, the scientists have used the spike's point to lay down a nanoscale pattern of molecules.

For both feats, the IBM researchers first wired an AFM tip to accept up to 10 volts. The electric fields thus produced then made molecules move up or down the spike's surface inside the thin film of water that forms naturally in humid air.

In their experiments, the scientists showed that a voltage propels a strand of DNA made of 16 chemical building blocks, or bases, more quickly than a strand that's only 5 bases long.

In this way, the electrified spike separated the molecules by size and electric charge—a process known as electrophoresis.

Automated machines today decipher the genomes of people and other organisms by carrying out electrophoresis of DNA pieces within fine glass tubes (*SN*: 8/6/05, p. 85). Other systems under development use microchannels etched in glass plates. The AFM-tip procedure could achieve separations 10,000 to 100,000 times as quickly as such capillary systems, the IBM team asserts in the May 1 *Applied Physics Letters*.

For example, a 15-base DNA segment that travels through a microchannel in 170 seconds could traverse an AFM tip in just 5 milliseconds.

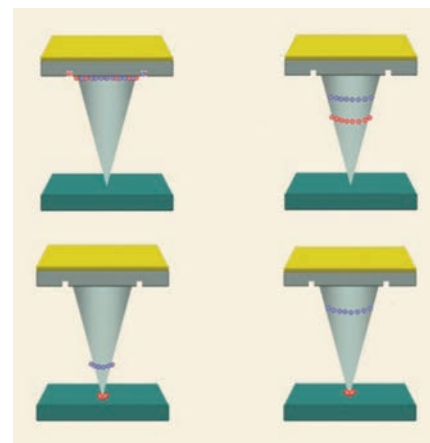
The new work offers "a very promising approach for fast electrophoretic differentiation of molecules," comments Narayana R. Aluru of the University of Illinois at Urbana-Champaign.

"It provides a new way to think about

#### QUOTE

“This is as thorough a study as has ever been undertaken of these issues.”

NEIL VIDMAR,  
Duke University



**TRAVEL TIP** Electrically driven molecules of different sizes and charges separate on the way from the base (upper-left image) of an atomic-force microscope tip toward its point (upper right). After some molecules are deposited on a surface (lower left), a voltage reversal drives others upward (lower right) for later deposit.

# SCIENCE NEWS

## This Week

separating and manipulating DNA molecules," adds Jeffrey A. Schloss of the National Human Genome Research Institute in Bethesda, Md. However, a practical gene sequencer must handle molecules hundreds of bases in length, he notes.

Wickramasinghe says that so far, 40-base DNA segments are the largest that his team's AFM tip has transported.

Showcasing another capability of the modified AFM tip, the researchers used voltage pulses to eject droplets of DNA molecules from the spike onto a silicon substrate. By moving the tip, scientists formed the nanoscale letters *IBM*.

Besides its potential as a DNA sequencer, Wickramasinghe says, the electrified AFM tip could also be a "nano inkjet printer." —P. WEISS

## Sharing the Health

### Cells from unusual mice make others cancerfree

**Immune-cell transplants from an extraordinary strain of mice that resists cancer can pass this trait to mice that aren't as lucky, according to a new study.**

Seven years ago, Zheng Cui and Mark Willingham of Wake Forest University in Winston-Salem, N.C., and their colleagues discovered a peculiar male mouse. The researchers, who were studying tumor growth, had injected this mouse and others with lethal doses of cancer cells. While the other rodents developed fast-growing tumors, the mouse, known as number 6, remained healthy. "We thought we'd made a mistake," says Willingham.

The mouse continued to thrive even after the scientists repeatedly injected it with a wide range of cancer-cell types in increasing amounts. Eventually, the researchers came to a surprising conclusion: The rodent was eradicating cancer cells from its body.

In breeding tests, the trait turned up in about 40 percent of the unusual mouse's offspring.

Cui, Willingham, and their colleagues suspected that the rodents' immune systems were fighting off disease. But they didn't know how the animals accomplished this feat or whether the cancer resistance could be transferred to normal mice.

Since then, the scientists have examined



**FADE TO PINK** This skin tumor on a normal mouse shrank and disappeared over the course of 3 weeks after the animal received immune cells from unusual mice that resist cancer.

the immune cells that swarm to cancer cells injected into the cancer-resistant animals. The majority of these responding cells are neutrophils, macrophages, and natural killer cells—the white blood cells that form the core of what's called the innate immune system. Unlike the adaptive immune system, the innate immune system recognizes invaders on first exposure.

The researchers discovered that selectively killing off one or two of the responding cell types didn't affect how well a cancer-resistant mouse fended off the disease. However, removing all three cell populations rendered the rodents as defenseless as normal mice.

When Cui and Willingham's team collected white blood cells from cancer-resistant animals and transplanted them into normal mice, the recipients became cancer resistant within several days.

The effect even worked retroactively. When the researchers injected the cancer-resistant animals' cells into normal mice that had skin tumors, the tumors vanished within weeks. The scientists noted that with one dose of cancer-resistant white blood cells, normal animals acquired cancer immunity that typically lasted for the rest of their lives.

Cui notes that the findings, reported in the May 16 *Proceedings of the National Academy of Sciences*, could eventually lead to drugs, cell transplants, or other therapies for cancer patients. He and his colleagues are now investigating which gene or genes are responsible for the cancer-resistant trait.

Howard Young of the National Cancer Institute in Frederick, Md., calls the report "a very intriguing paper, which raises more questions than it answers." He notes that an understanding of the mechanism by which the mice reject tumors might provide insight into the scattered medical reports of people spontaneously recovering from cancer. However, he adds, "although success in mice is encouraging, translation into diseases in people is a long way down the road."

Agreeing that looking for clinical applications is "superpremature," immunologist Nora Disis of the University of Washington in Seattle says that the unusual rodents might serve as a tool for studying how the innate immune system affects cancer. "Most

of the tumor-immunity world focuses on [the adaptive immune system], but there's a burgeoning interest in the innate immune system's role," she adds. —C. BROWNLEE

## Blast Survivors

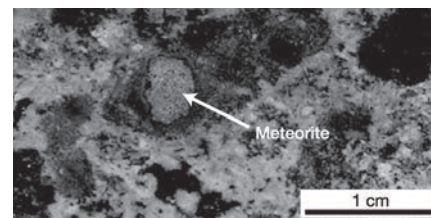
### Fragments of asteroid found in ancient crater

**Pieces of an asteroid that blasted a 70-kilometer-wide crater in southern Africa millions of years ago have been found intact within the crater, a unique discovery that defies models of such collisions.**

The Morokweng crater lies beneath a 150-to-200-meter-thick layer of sand in the Kalahari Desert. Scientists detected the ancient scar a decade ago after noting anomalies in the planet's magnetic and gravitational fields in that region, says Rodger J. Hart, a geochemist at University of the Witwatersrand in Johannesburg.

Analyses of samples that his group has drilled from the crater have revealed an 870-m-thick sheet of rock that melted from the heat of the asteroid's impact and then cooled in subsequent millennia. Radioactive dating of mineral crystals in that rock suggested that the collision occurred about 144 million years ago.

The scientists now report that at a depth of 766 m, a borehole pierced a beach ball-size rock that bears the chemical signature of an extraterrestrial object. The rock's inner portions seem so pristine that they must never have melted and mixed with the once-molten surrounding material. Smaller chunks of similar rock, many measuring less than a centimeter across, were found all along the borehole but were particularly common at



**SPACE ROCK** Drilled sample contains a piece (arrow) of the asteroid that blasted the Morokweng crater in the Kalahari Desert 144 million years ago.

PNAS; W. MAIER ET AL./NATURE



depths between 345 and 400 m. Hart and his colleagues describe their find in the May 11 *Nature*.

Extraterrestrial objects that cross Earth's orbit do so at an average speed of about 20 km per second. Small, stony meteorites typically break up high in the atmosphere (SN: 7/19/03, p. 36). However, large objects such as asteroids slam into Earth at full speed, generating intense heat and pressure. Before the team's discovery, scientists had thought that any object large enough to create a crater more than 4 km across would completely melt or vaporize upon impact, says Hart. Obviously, he notes, the new find challenges that assumption.

Although fragments of rock purported to be pieces of crater-forming extraterrestrial objects have been found in debris thrown far from other impact sites around the world, no such fragment had ever been discovered within a crater.

"This is pretty interesting," says Frank T. Kyte, a geochemist at the University of California, Los Angeles. "This will make a lot of people rethink the impact process."

The chemical signature of the object that blasted the Morokweng crater—low in sodium and potassium but high in uranium, thorium, and lanthanum—isn't typical of meteorites falling to Earth today, says Hart. That's a sign that the object originated in a different part of our solar system's asteroid belt than today's source of meteorites, he notes. —S. PERKINS

## Sleight of Herb

### Black cohosh mislabeled in medicinal products

**A sizable fraction of the herbal supplements marketed as preparations of black cohosh contain none of that North American plant, researchers report. Some past studies suggested that black cohosh lessens menopausal symptoms, but 3 of 11 recently tested products instead contained related Asian species not known to have this effect.**

Hundreds of thousands of women use black cohosh to combat hot flashes, estimates chemist Steven Dentali of the American Herbal Products Association, a trade group. A harvest of nearly 160 tons of the plant, mostly from the Appalachian wilderness, was reported in 2003. Root extracts go into capsules and tablets.

In the United States, herbal supplements are less strictly regulated than drugs are. Past research has turned up various herbal products that have been adulterated or lacked the natural product that they advertised on their labels (SN: 6/7/03, p. 359).

The "new twist" is that cheap, imported raw materials have become secret substitutes for black cohosh, which is in increas-

ingly short supply, says Fredi Kronenberg of Columbia University, an investigator in the new study.

To probe the chemical variability among black cohosh supplements, Kronenberg, natural-products chemist Edward J. Kennelly of the City University of New York, and their colleagues purchased 11 commercially available brands of the product. They then used two methods to study the molecular mixtures in the supplements and determine which plants had been used as raw materials.

They found that four of the products contained Chinese herbs known collectively as sheng ma, which have molecular profiles similar to that of black cohosh. Only one of those products also contained some black cohosh, they report in the May 3 *Journal of Agricultural and Food Chemistry*.

"A surprising number of products that are sold as black cohosh in the U.S., at least when we got them between 2002 and 2004, do not contain black cohosh," says Kennelly. "These were clearly misbranded" and therefore in violation of federal labeling regulations, he says. Kennelly's team didn't identify the brands that lacked black cohosh.

Substitution of one herb for another—by either unscrupulous manufacturers or their botanical suppliers—is a consequence of rising demand for black cohosh, adds Bill J. Gurley of the University of Arkansas for Medical Sciences in Little Rock.

Dentali says that supplement makers should employ methods similar to those used in the study to make sure that they've purchased the right ingredients.

"The methods that some members of the industry are using are not rigorous enough," Kennelly says. —B. HARDER

## Monkey Business

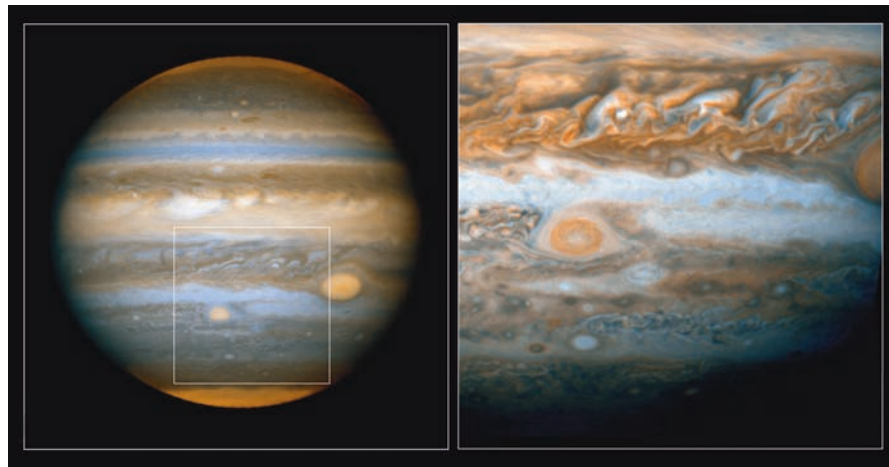
### Specimen of new species shakes up family tree

**A species of Tanzanian monkey first identified last year may actually require a separate genus, says an international research team. It would be the first new genus for monkeys in 79 years.**

Last year, the rare, reclusive monkey was classified as a mangabey and named *Lophocebus kipunji* (SN: 5/21/05, p. 324). The two research groups that named it had worked from field observations and photographs but didn't have a specimen for anatomical and genetic analysis.

Since then, Tim R.B. Davenport of the Wildlife Conservation Society's branch in Tanzania, one of the original namers, received a kipunji cadaver from a farmer's trap. Its body characteristics and DNA place the species in a new genus, located on the family tree close to baboons, Davenport and his collaborators report in an upcoming *Science*.

"This will, of course, generate some controversy," says Davenport's collaborator Link Olson of the University of Alaska Museum in Fairbanks, who analyzed the DNA.



### Hubble eyes Jupiter's second red spot

Say hello to Red Jr. These Hubble Space Telescope images, released last week, are the sharpest views yet of a second red storm high in Jupiter's atmosphere. About half the diameter of the planet's venerable Great Red Spot (right of box in left image), the newer storm was white when it arose 6 years ago from the merger of three oval storms first seen in the 1930s. By this February, the disturbance had turned red (SN: 4/8/06, p. 222). The planetwide portrait is a false-color composite of visible-light and near-infrared images. It depicts both the red spots and other high-altitude features in orange hues. The close-up, color-enhanced Hubble picture (right), taken in blue and red light only, shows that some pale clouds lie at the center of the new red spot. —R. COWEN

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## This Week

Taxonomists have often split and revised genera, but the last new monkey genus was named in 1927: *Oreonax*, a type of woolly monkey.

Last year, Davenport's team and a group including Trevor Jones of Udzungwa Mountain National Park happened upon kipunjis in separate forests. They heard about each other's work only when a member of each team happened to meet in a bar.

Last August, a farmer near Mount Rungwe found a dead kipunji in a trap he set for animals raiding his maize field. Davenport sought advice on specimen handling from mammalogist William T. Stanley of Chicago's Field Museum.

Stanley was doing fieldwork near an island village when his cell phone received scraps of text messages from Davenport. "I was running around this soccer field on the edge of the Indian Ocean trying to get a signal," he says.

Stanley flew to Tanzania and with the biologists there distributed specimen samples to labs in Tanzania and the United States.

Olson reported that the five sections of kipunji DNA that he analyzed put the animal closer to baboons than to mangabeys. But when researchers compared the young male with baboons in the Field Museum's collection, they concluded that it didn't fit well among baboons, says Stanley.

Because the animal's genetics argues against mangabeys and the monkey doesn't look like a baboon, the researchers proposed the new genus: *Rungwecebus*.

Todd Disotell of New York University (NYU) finds the proposal "extraordinarily premature." For example, he says that the database sequences Olson used need updating.

NYU primatologist Clifford Jolly, who has studied baboon evolution, is likewise skeptical. However, he says that if the new family tree turns out to be right, kipunjis could be interesting survivors of an ancient lineage. —S. MILIUS

## Cattle's Call of the Wild

### Domestication may hold complex genetic tale

A new investigation of DNA that was obtained from modern cattle and from fossils of their ancient, wild ancestors puts



**MANGABOONS** Scientists are proposing a new genus name for the rare, reclusive kipunjis of Tanzania, which communicate with characteristic honk barks.

scientists on the horns of a domestication dilemma.

The new data challenge the mainstream idea, based on earlier genetic and archaeological evidence, that herding and farming groups in southeastern Turkey or adjacent Near Eastern regions domesticated cattle perhaps 11,000 years ago. According to that view, these groups then introduced the animals throughout Europe, so current European cattle breeds would trace their ancestry directly back to early Near Eastern cattle.

Instead, cattle domesticated in the Near East interbred with their wild, now-extinct cousins, known as aurochs, already living in some parts of Europe, concludes a team led by geneticist Giorgio Bertorelle of the University of Ferrara in Italy. The domesticated cattle may also have mated with African cattle that had been shipped to southern Mediterranean locales.

"European cattle breeds represent a more diverse and important genetic resource than previously recognized, especially in southern regions," Bertorelle says. He and his colleagues present their provocative findings in an upcoming *Proceedings of the National Academy of Sciences*.

The researchers examined chemical sequences of mitochondrial DNA, which is inherited from the mother. Ancient sequences were isolated from five Italian aurochs fossils previously dated at between 7,000 and 17,000 years old. Comparable genetic information was gleaned from more than 1,000 cattle in 51 modern breeds from Africa, Asia, Europe, and North America.

Italian aurochs display mitochondrial-DNA sequences that often occur in cattle today, Bertorelle's group asserts. The strongest genetic resemblance appears between these aurochs and Italian cattle,

followed by less and less similarity in cattle in central and northwestern Europe, the Near East, North America, and Africa.

Greater amounts of genetic variability in cattle from southern versus northern Europe suggest that Mediterranean herders let their cattle roam and mate with wild aurochs, whereas northern herders often kept cattle in guarded areas, Bertorelle adds.

Further analyses showed that certain mitochondrial-DNA sequences found in North African cattle today also commonly appear in breeds from Portugal, Spain, Italy, and Greece, but not areas farther north. Occasional boat transport of cattle from North Africa to southern Europe would explain this finding, in Bertorelle's view.

Molecular anthropologist Joachim Burger of Johannes Gutenberg University in Mainz, Germany, expresses surprise at the new report. Northern European cattle breeds today derive directly from ancient Near Eastern cattle, according to his group's recent analysis of mitochondrial

DNA from more than 60 modern cattle and 43 aurochs fossils in northern Europe.

"We need to examine genetic data more closely to resolve this issue," Burger says. Studies of DNA in cells' nuclei will prove critical, although it's difficult to extract this genetic material from fossils he notes.

In the meantime, a more thorough investigation will require comparison of mitochondrial DNA obtained from radiocarbon-dated aurochs fossils throughout Europe with that of cattle today, remarks archaeologist Albert J. Ammerman of Colgate University in Hamilton, N.Y.

It's not clear whether domesticated cattle first moved from northern Africa to southern Europe, as assumed by Bertorelle, or vice versa, Ammerman notes. —B. BOWER

### QUOTE

“European cattle breeds represent a more diverse and important genetic resource than previously recognized.”

GIORGIO BERTORELLE, University of Ferrara



# Can we get a clear picture of Jesus from the Gospels?

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Instead of searching for the figure *behind* the Gospels, Professor Johnson

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leads you on an investigation of the even more fascinating figure *in* them. Only after the full range of these literary portrayals has been considered can the question of "the real Jesus" be addressed. And you will find that it may not be answerable in strictly historical terms.

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# PREDICTING PARKINSON'S

## Researchers search for early warnings in the brain

BY CAROLYN GRAMLING

In the painting "Nude with Parkinson's," a woman kneels forward onto her elbows, bent under the weight of swirls of red, orange, and black. "[It] shows my struggle to maintain balance while being pummeled by the demands of everyday life," says artist and Parkinson's patient Carol McLeod. As her symptoms worsen, she adds, keeping up with those demands is a constant, and growing, battle.

This work was one of several hundred paintings, poems, and songs on exhibit last February at the first annual World Parkinson Congress in Washington, D.C. As participants examined the artwork produced as a therapeutic exercise by Parkinson's patients, many in the most-debilitating stages of the disease, scientists spoke to attentive audiences of other scientists, medical professionals, patients, and caregivers. Much of the exciting research at the meeting focused not on people struggling with late, severe symptoms of Parkinson's disease but on those in whom the illness had not yet become, or was just beginning to become, apparent.

The disease's progressive, debilitating effects result from the slow but inexorable die-out of nerve cells in a region of the central brain called the substantia nigra. A variety of insults can trigger that cell death. The vulnerable cells produce dopamine, one of the neurotransmitters that manage the flow of signals from the brain to the body's muscles.

As the brain cells die, there's less dopamine available to transmit these signals, so Parkinson's patients endure muscle tremors, difficulty balancing, slowed movement, dementia, and, eventually, paralysis. Because dopamine also regulates mood, patients short on that neurotransmitter may suffer from depression.

Currently, doctors use its characteristic motor symptoms to diagnose Parkinson's. By the time those overt signs become apparent, however, a great deal of damage to the nerve cells has already been done, says David Eidelberg, a neurologist at New York University School of Medicine. Today's therapies, primarily dopamine replacement, can slow that progress. Yet as the disease progresses, motor symptoms respond less well to dopamine-replacement treatment.

Medical scientists know what a Parkinson's patient's brain typically looks like both when symptoms first appear and as patients follow the largely predictable path of the disease. The challenge now is to characterize what happens before visible symptoms of the

disease show up. "We need a reliable and objective measure" to find those signs, Eidelberg says. If physicians could detect Parkinson's disease earlier, they might learn how to arrest damage before there's permanent impairment.

For early diagnosis, scientists are looking for genetic signatures, brain-activity patterns, and blood cell characteristics that indicate the disease.

"Since Parkinson's disease can be initiated by multiple triggers... there must be some kind of [common] pathway that defines the response to the injury," says Howard Federoff of Albert Einstein College of Medicine in Rochester, N.Y. "If we understand that pathway, we might be able to identify new strategies for therapy."

**GENETIC COMPLEXITY** Researchers want to develop a test that measures a biological characteristic, or biomarker, that would indicate a propensity for the disease or would change in a specific way during the early Parkinson's stages.

Markers that predict whether a person will develop Parkinson's have proved elusive. The disease has a hereditary component, but the genetics of Parkinson's is so far much murkier than that of Huntington's disease, another neurodegenerative disorder.

"Genetic testing for Huntington's [disease] is easy," says neurologist Martha Nance of Struthers Parkinson's Center in St. Louis Park, Minn. A person will acquire Huntington's if he or she has a defect in a single, specific gene. This certainty is described as 100 percent penetrance.

The case is less straightforward for Parkinson's. At least four different genes appear to be related to the onset of the disease, Nance says. So far, clinical tests suggest that a defect in any one of three of the genes doesn't always result in Parkinson's disease. The fourth gene has a penetrance of nearly 100 percent, but the disease may not show up until age 80.

Faults in the four genes appear to trigger nerve cell death in different ways. A defect in the *PARK1* gene can cause the concentration of the protein alpha-synuclein to become so high that clumps deposit around and damage dopamine-producing cells. Defects in another gene, called *DJ-1*, prevent it from protecting dopamine cells against highly reactive oxygen molecules.

The *tau* gene, which has been linked to other neurodegenerative diseases, such as Alzheimer's, has also been connected to late-onset Parkinson's. And in 2004, scientists identified what appears to be the most-direct genetic link to the disease: the *LRRK2* gene, which encodes for a protein that controls other proteins' activities.



**A HEAVY LOAD** — Carol McLeod's self-portrait expresses the burden of her everyday life while battling Parkinson's disease.



But genes aren't the only triggers for the disease. At least one environmental contaminant, an industrial chemical called MPTP, has been directly linked to the onset of Parkinson's, and researchers have found that some herbicides, pesticides, and heavy metals may cause symptoms similar to those of the disease.

Most people diagnosed with Parkinson's say they would have wanted to know whether they had the disease well before symptoms appeared, according to a survey that Nance and her colleagues recently conducted at the Struthers Parkinson's Center. Furthermore, a majority of relatives of patients said that they would choose to take a Parkinson's test if one were available, the researchers reported at the World Parkinson Congress.

**VISIBLE LOSSES** Like a time-lapse series of snapshots, repeated imaging of the substantia nigra can both track the disease's progression and monitor the effects of treatment.

The primary tools of the trade are positron-emission tomography (PET) and single-photon-emission computed tomography (SPECT) scans, with which scientists can find and measure changes in dopamine and other neurochemicals in the brain. Imaging can also reveal the effect of Parkinson's therapies such as levodopa, which replaces depleted dopamine, and deep-brain stimulation, in which doctors install in the brain a pacemakerlike device that sends electric pulses to target areas to prevent the signals that cause tremors and rigidity (*SN*: 3/12/05, p. 174).

Many in the imaging field are now looking for markers that will indicate whether a patient has the disease before the characteristic motor symptoms appear, Eidelberg says.

In 2002, researchers in Ireland tracked dopamine production in the brains of people with minor muscle tremors but who hadn't been diagnosed with Parkinson's disease. After the participants received a gamma-ray-emitting compound that binds to dopamine-producing brain tissue, a computerized tomography scanner assessed dopamine production. With this method, the researchers found that only 5 of the 50 patients showed normal dopamine production. This trait proved to be a better predictor of whether the participants would later develop Parkinson's than did the severity of their minor tremors, the researchers found (*SN*: 12/14/02, p. 382).

Eidelberg and his group are working to uncover even earlier signs of illness. Although dopamine has been the primary target for imaging, it may not be the most effective one, Eidelberg says.

"Dopamine is already two-thirds diminished by the time symptoms develop," he says. As the brain's dopamine concentrations continue to decrease, he adds, it becomes even harder to accurately measure changes in the neurotransmitter's concentrations.

Scientists have known for a decade that loss of smell, excessive daytime sleepiness, and some behavioral disorders can foreshadow the motor symptoms of Parkinson's disease. These early symptoms aren't specific enough for a definitive diagnosis, but they hint that the disease may begin in regions of the brain other than the substantia nigra, Eidelberg says.

In 1994, Eidelberg visualized cellular metabolism by measuring fluoro-deoxy-glucose (FDG), which cells take up when they're active. Parkinson's patients showed an overactive pattern of metabolism in several brain regions related to motor function. The ele-

vated activity occurred not just in the subcortical brain, which includes the substantia nigra, but also in the motor cortex, which issues neural commands to the body's muscles, and the cerebellum, which regulates posture and balance.

Chengke Tang, who works with Eidelberg, recently used a radioactive isotope of oxygen to look at blood-flow patterns in the brain. Tang found a strong correlation between the altered flow in Parkinson's patients and Eidelberg's pattern of aberrant brain metabolism. Tang presented his findings at the February Parkinson's meeting.

Parkinson's disease produces changes in cognitive as well as motor areas of the brain, Dutch neuropathologist Heiko Braak and his colleagues reported in 2003. They noted the changes late in the course of the disease, when dementia often occurs.

Eidelberg's team is looking for a Parkinson's-specific pattern in cognitive areas of the brain in late-stage patients who are experiencing dementia. If a pattern can be established, Eidelberg says, a single PET image may serve to monitor both motor and nonmotor aspects of the disease.

**IT'S IN THE BLOOD** Other scientists are looking at blood chemistry as a window on the brain. Federoff suggests that there may

be a common biochemical signature that would indicate the presence of Parkinson's, whether the disease arises from genetic or environmental factors.

"Our hypothesis is that the blood shares many cellular-signaling pathways with the nervous system," Federoff says. If so, blood would be affected by many of the factors that influence the brain. "Some of the same biochemical dysfunctions in white blood cells may also be disordered within the brain," he adds.

Federoff and his colleague Timothy Mhyre of the University of Rochester College of Medicine have been working with white blood cells to identify RNA and protein patterns

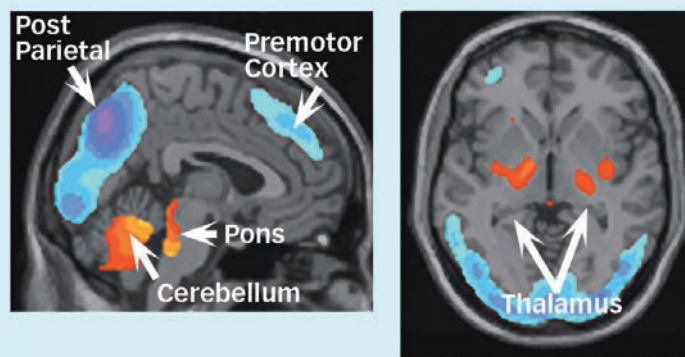
that are associated with the onset and progression of Parkinson's and Alzheimer's diseases. The goal, Mhyre says, is to create profiles that distinguish Parkinson's patients from people with other neurological disorders as well as from neurologically healthy people.

He and Federoff examined white blood cells from groups of Parkinson's patients with cognitive impairment, Parkinson's patients with normal cognitive function, Alzheimer's patients, and people with no illness.

Molecular signatures in the cells were indeed distinct from group to group in preliminary results that Mhyre and Federoff presented in February at the World Parkinson Congress. Still, they warn, it's a long step from identifying the signatures to predicting who will develop the disease.

No matter how early scientists can make a Parkinson's diagnosis, physicians still will need an effective strategy to prevent nerve cell death. Mhyre says that if the patterns that he and his colleagues have discovered reveal the earliest steps in the sequence of events that leads to the loss of dopamine neurons, "we may be able to develop new targets for therapies."

The biomarkers currently being developed to identify the disease and monitor its impact will make future treatments more effective, Eidelberg notes. "Opportunity favors the prepared mind," he says. ■



**ALTERED STATES** — These positron-emission tomography images show brain areas with unusual metabolic activity in a Parkinson's disease patient. Side view (left) shows that regions that coordinate physical movement are red, indicating overactivity when compared with normal metabolism. Brain regions associated with movement execution and skill learning are blue, indicating less activity than normal. Cross section (right) shows that the thalamus is another area associated with physical coordination that's overactive in the Parkinson's patient.

# NECTAR: THE FIRST SOFT DRINK

Food coloring, preservatives, and all

BY SUSAN MILIUS

**P**ressurized fizz and industrial processing aside, modern soft drink makers lag millions of years behind the curve, still catching up with the original purveyors of tasty, sugary beverages. Flowering plants have spent aeons competing with each other to coax animals to choose their formulation of something sweet. While sweetness is important, any devoted fan of a particular brand of soft drink will tell you that a truly alluring elixir has so much more.

Botanists once spoke of nectar as basically sugar water, but in the 1970s, when two researchers checked hundreds of flower nectars, plenty of other ingredients turned up, including amino acids and alkaloids. Researchers are still exploring these and other nectar ingredients. They're also determining the compounds' market appeal.

While a successful recipe brings financial profit to beverage companies, nectars attract animals that provide a service to the plant. Usually it's the transport of pollen from flower to flower, but some plants drip nectar from their leaves or stems to attract insects that protect them from pests.

Most kinds of additives dreamed up by today's drink manufacturers have, with recent research, been recognized in plant nectars. Coloring to beguile the eye? Scents to interest the nose? Health boosters? Preservatives? Some plants have mixed each of these into nectar concoctions.

**RAINBOW APPEAL** Even before a pollinator tastes nectar, the seduction begins. For example, although most nectars are colorless, some plants use bright colors to advertise their liquid appeal. Other nectars give off specific aromas.

The question of food coloring in nectars—all natural, that is—has gained scientific attention thanks to a gardener in the greenhouses at Århus University in Denmark. In the early 1990s, the gardener told ecologist Jens Olesen that one of the rare flowers, the blue-purple bellflower called *Nesocodon mauritianus*, had blood-red nectar. As Dennis Hansen, an Århus student at the time, summarizes events, "Jens said, 'Bollocks! You're drunk! Nectars don't

have colors!' And they went to look, and the nectar was red."

Danish research teams then visited the island nation of Mauritius, east of Africa, and spent days watching the cliff-face home of the last 130-or-so known plants of the species. The observers had hoped to spot a native pollinator, especially one with a preference for red nectar, but they failed.

However, while traveling in Mauritius, they had identified two other species—of the genus *Trochetia*, in another botanical family—that produce colored nectar. The researchers believed these were the only three species in the world with colorful nectar, notes Hansen,

who's now at the University of Zurich. "In scientific papers, you always have to say, 'To the best of our knowledge ...,'" he says. "Since then, our knowledge has been bettered."

After reading the article, people wrote to the Danish researchers from around the globe pointing out overlooked flowers with colored nectar. When the tally reached 11 species, Hansen decided to write an update.

To make sure that his list was complete, he and several collaborators chased down obscure journals that don't show up in databases and spent hours searching on the Internet for the phrase colored nectar translated into many languages. This ploy led him to Swedish chats about a hoyo species grown as a houseplant. Its dark nectar drips on furniture, and people were offering tips about coping with dribbles. "Some of my best pictures [of col-

ored nectar] came from Swedish housewives," Hansen says.

By this March, the tally had topped 60 species making, for example, red, yellow, or black nectars. These plants are scattered in 14 families and located around the world.

There are now four known populations of the rare *Nesocodon* bellflower plus *Trochetia* patches. Some of these plants live among potential pollinators: geckos with a taste for nectar.

To see whether geckos prefer colored nectar, Hansen and his colleagues worked on a Mauritian islet inhabited by a gecko species found on the cliff faces. The researchers could test the geckos' innate preference because the colored-nectar plants typically don't grow on the islet and so the animals hadn't been exposed to them.

The researchers made artificial flowers by sticking cardboard petals on painted laboratory tubes and filling them with various sugar solutions. Within half an hour of setting out a pair of fake flowers, the researchers typically saw a gecko skitter over to check out the contraptions.



**NOT CLEAR** — Although most flowers have clear nectar, several dozen carry colored solutions, such as the yellow liquid glinting in this *Trochetia blackburniana* flower. New tests show that a gecko species prefers a colored nectar (inset).

HANSEN



The animals usually paused to look at the baits for several minutes and then darted to drink at one. More than two-thirds of the geckos chose a flower with colored nectar, tinted red or yellow with food coloring, instead of its nearby twin with colorless nectar.

The bright liquids inside the white tubes seemed innately appealing to the lizards, Hansen and his colleagues report in an upcoming *Biology Letters*.

Like colors, nectar scents may provide another come-on to pollinators. Under some circumstances, a plant might benefit from letting its pollinators tell by just a sniff whether a flower brims with nectar or has already been emptied, Robert Raguso at the University of South Carolina in Columbia proposed in 2004.

For example, nectar of an evening primrose, *Oenothera primiveris*, smells sharp and pungent, he says. He found methyl benzoate, as well as another volatile chemical, wafting away from the nectar. Yet his tests didn't pick up either of the scents in petals or other flower parts. Since then, he and his colleagues have identified a second unique component, 1-pyrroline. "It has a most unpleasant odor reminiscent of bleach," says Raguso.

The nectar of the century plant, *Agave palmeri*, smells like an over-ripe melon, he says. Seven of the 17 volatile compounds he found in it didn't occur in the flower tissues around it. Some of these special nectar compounds, such as short-chain alcohols and ketones, could be fermentation products, he says. Since his 2004 report, Raguso has found signs of fermentation in the nectar of a flower in the genus *Protea*. When fresh, it smells like papaya but later develops the odor of honey beer. Plants and their microbial lodgers may have beaten humanity to the invention of brewing too.

**HEALTHY DRINKS** Biologists are intrigued by the possibility that plants also invented health-and-energy drinks for pollinators, not to mention agents that keep the beverage fresh.

In 2002, Robert Barclay of the University of Calgary in Alberta reported the calcium content of 22 species of Australian flowers. He proposed that flowers visited by nectar-and-fruit-feeding bats tended to offer a bit of extra calcium as a potential boon for lactating females.

More recently, Robert Thornburg of Iowa State University in Ames and his colleagues have suggested that ornamental tobacco offers its insect visitors an energy drink.

From the plant's nectar, Thornburg identified 11 of the 20 amino acids that living organisms commonly hitch together to form proteins. One, proline, appeared in high concentrations, at almost triple the concentration of the next-most-abundant amino acid. Two wild plants, soybean species from Australia, likewise showed abundant proline in nectar.

Earlier studies had indicated that insects' flight muscles burn a lot of proline during the initial phases of flight. It's a better short-term energy source than glucose, Thornburg says, because it doesn't need as much of a jolt of energy to start its breakdown.

Thornburg performed experiments using bees, which pollinate many types of plants, including soy. Previous work had shown that a bee's taste receptors for salts respond to proline. When Thornburg offered honeybees sugar solutions flavored with proline, the one they preferred had a proline concentration similar to that of the tobacco and soy nectars.

Honeybees may have a taste for performance drinks, Thornburg and his colleagues propose in an upcoming *Naturwissenschaften*.

That's a preference that farmers could turn to their advantage, says Thornburg. If researchers could figure out how to boost the proline content of nectars in crop plants, he says, perhaps more insects would visit. Those additional visits could increase pollination, which would raise the number and the size of fruits.

Letting nutritious brews such as nectars sit around in unrefrigerated blossoms could have disgusting consequences, especially with pollinators tracking who-knows-what into a flower. "They can be in the barnyard this morning and, in the afternoon, get into a plant's reproductive tract," says Thornburg.

In the early 1990s, a chance remark from a colleague started Thornburg thinking about protein in nectar. "I had never considered that nectar was anything but a simple sugar water," he recalls. "Boy, was I wrong."

That afternoon, Thornburg ran a lab test that indicates proteins as blots on a gel strip. "Lo and behold, there were proteins," he says. "I still have the gel on my desk."

He was on sabbatical at the time his lab finished identifying the first of the five proteins. As soon as he got the e-mail with the results, he says, he plunged into databases to find similar compounds. Those chemical cousins produce bursts of hydrogen peroxide in cells, and his colleagues back in the lab soon determined that the nectar protein could do that too.

The hydrogen peroxide produced in cells is the same chemical that drugstores sell to disinfect kids' skinned knees. However, working out the functions of the five nectar proteins took Thornburg and his colleagues 11 years.

In the November 2005 *Plant Physiology*, the research team

described the workings of the most elusive of the five proteins that create a floral-hygiene system. The infection-fighting hydrogen peroxide spins off highly reactive free radicals that can wipe out necessary cell chemistry. Fortunately, some of the five proteins detoxify the free radicals.

Plants may have pioneered another soft drink ploy—adding stimulants. Caffeine and nicotine show up in plant nectars, and Natarajan Singaravelan of the University of Haifa at Oranim in Israel and his colleagues are testing the hypothesis that such extras might keep pollinators coming back for more.

Some citrus nectars, for example, carry a jolt of caffeine. Although science can't yet say whether caffeine gives bees a buzz, they seem to like it. When the researchers offered free-flying honeybees a variety of caffeine-containing sugar solutions plus a caffeine-free version, the bees preferred a mildly caffeinated option. They made about 20 percent more visits to this spiked solution than to the plain-sugar one, the researchers reported in the December 2005 *Journal of Chemical Ecology*.

Sugary sips with just a touch of nicotine, either 0.5 or 1 parts per million (ppm), attracted more bees than plain-sugar solution did, the researchers said in the same paper. The nectar of some tobacco species as well as that of linden trees carries between 0.1 and 5 ppm nicotine. Caged bees and their broods fed sugar solutions with dashes of nicotine showed no obvious ill effects, the researchers reported in the January *Journal of Chemical Ecology*.

**PRODUCTION PROBLEMS** There's still toxic stuff in some nectar, though. The 1970s surveys by Herbert Baker and Irene Baker, both since deceased, turned up alkaloids, a group of compounds that includes plant-chemical warfare agents, in 9 percent of the species' nectars. Another worrisome set of compounds—amino acids



**SIPPING TOBACCO** — Ornamental tobacco flowers turn their nectar into an insect version of an energy drink, according to a new study. The flowers attract plant chemists (inset) as well as insects because the abundant nectar is easy to collect.

that organisms don't routinely use in proteins and that can sabotage natural processes—appeared in about half of the nectars.

For years, biologists dreamed up potential advantages for nectars that are harmful to some animals, says Lynn Adler of the University of Massachusetts in Amherst. For example, theorists proposed that a nectar repellent to many creatures might result in fewer visits from sloppy, go-everywhere pollinators that would waste a plant's pollen on other species.

Then there was the "drunken-pollinator" hypothesis. Some nectars include ethanol or other intoxicants, and bees act oddly after imbibing. So, the theory goes, pollinators that drink spiked nectar get lackadaisical about grooming and careen around in a disheveled state delivering unusually large amounts of pollen.

In the November 2005 *Ecology*, Adler and Rebecca Irwin of Dartmouth College in Hanover, N.H., published what Adler suspects is the first test of whether toxic nectars aid plant reproduction. They used Carolina jessamine (*Gelsemium sempervirens*), a vine that bursts out in yellow flowers during March and April in its southeastern-U.S. range. Its nectar carries the toxin gelsemine, a substance also found in leaves that botanists suspect keep pests from chewing there.

In experimental plots of the vine, researchers made the rounds every morning during blooming season, carefully pipetting droplets into each open flower. Some flowers got extra doses of gelsemine, while others got a sugar solution that diluted their

natural nectar's gelsemine concentration. To estimate how much pollen the insects moved, the researchers dusted flowers with fluorescent dye as a proxy for pollen.

Researchers then hovered around the plot clutching tape recorders to dictate running accounts of insect visits, which exceeded

3,000 by the end of the experiment.

"Ultimately, we found that pollinators really don't like toxic nectar," says Adler. Compared with diluted gelsemine, extra gelsemine cut short insects' visits to a particular flower and reduced the number of flowers visited. At each stop, the pollinators passed along only half to two-thirds as much pollen from the high-gelsemine plant as from low-toxin plants.

No advantage of extra gelsemine showed up. Carpenter bees still drilled holes in the flowers and drained nectar without carrying pollen to other plants. "So far, we're seeing mostly costs," says Adler.

She says that she's begun questioning whether toxic nectars do any good for plants. The toxic compounds that show up in nectar also

appear in plant leaves, where they seem to discourage grazing by mammals and insects. The compounds could simply be leaking out of the plant into the nectary.

If defensive chemicals turn up in nectar but provide no benefit there, then plants could win yet another distinction. They could have been the first food manufacturers to face the problem of pesticide contamination. ■



**TOXIC NECTAR** — Nectar of the Carolina jessamine flower carries gelsemine, which can poison bees and mammals exposed to substantial doses. Researchers debate whether the toxin confers some evolutionary advantage or is just an unfortunate side effect of the plant's overall chemical defenses.

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## OF NOTE

### ASTRONOMY

## Crust on a star

By analyzing X rays generated by the rumblings of a neutron star 40,000 light-years from Earth, astronomers have estimated the thickness of the dense star's crust.

In December 2004, spacecraft including NASA's Rossi X-ray Timing Explorer detected the brightest X-ray flash ever seen from beyond the solar system (*SN: 2/26/05, p. 132*). The radiation came from an explosion on the neutron star SGR 1806-20.

Intensity fluctuations within the flash were probably generated by seismic vibrations traveling along different paths within the star's iron crust, according to astronomers led by Tod Strohmayer of NASA's Goddard Space Flight Center in Greenbelt, Md. X rays

of some frequencies would have come from seismic waves on twisting paths around the star's circumference, while other X rays were probably generated by vibrations on a more direct path through the crust.

If a previous estimate is correct that the neutron star is about 20 kilometers across, then the crust is about 1.6 km thick, the team announced last month at a meeting of the American Physical Society in Dallas. That thickness supports theoretical models in which neutron stars consist of ordinary matter. A star made of exotic subatomic particles would form a much thicker crust, according to some models. —R.C.

### BIOMEDICINE

## An aging protein?

The same protein that, when defective, causes a premature-aging disease may also play a role in normal aging.

Children with Hutchinson Gilford Progeria Syndrome (HGPS) have maladies of aging, such as baldness and arthritis.

Yet "it hasn't been clear at the molecular level that this ... has anything to do with aging," says Tom Misteli of the National Cancer Institute (NCI) in Bethesda, Md.

Misteli and his NCI coworker Paola Scaffidi examined skin cells taken from HGPS patients and elderly people and found the samples to have similar defects.

Studies have identified a mutant version of the protein lamin A as the cause for HGPS. To see whether the defects in elderly patients' cells could be attributable to abnormal lamin A, the scientists applied a genetic technique that mends the defective protein. When the elderly patients' cells later divided, their offspring cells looked and behaved like cells taken from younger people, the researchers report in an upcoming *Science*.

Misteli and Scaffidi speculate that with age, cells might less successfully counter damage from this protein. Misteli says that it's too early to speculate about a treatment for human aging. "This is far from a miracle cure for anything," he says. —C.B.





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## MEETINGS

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## ANATOMY

## Ancient islanders get a leg up

Fossils of a humanlike species dubbed *Homo floresiensis* that lived on the Pacific island of Flores between 18,000 and 12,000 years ago recently grabbed headlines because scientists deduced that this creature stood no more than 1 meter tall and possessed a surprisingly small brain. Nonetheless, *H. floresiensis* packed considerable weight on its diminutive frame and possessed far stronger legs than people do today, says William L. Jungers of the State University of New York at Stony Brook.

Jungers and his colleagues used a computed tomography scanner to measure the thickness and shape of three *H. floresiensis* leg bones from two individuals. Members of that species were shorter than today's tiniest folk, Jungers notes. Still, the ancient individuals had leg bones as thick as those of some modern adults who would have towered over them, he says.

Calculations based on measures of upper-leg-bone lengths and thicknesses showed that these individuals had a leg strength "in another universe," according to Jungers, compared with estimates for *Homo sapiens* from that time and measurements of modern people.

*H. floresiensis* adults weighed an estimated 25 to 35 kilograms (55 to 77 pounds). In body size and build, Jungers says, the Flores individuals strikingly resemble Lucy, the 3.2-million-year-old *Australopithecus afarensis* skeleton from eastern Africa.

Some other investigators suspect that the Flores remains come from small people who had a genetic condition that drastically reduced their brain size (*SN*: 10/15/05, p. 244). —B.B.

## TOOLMAKING

## Neandertals take out their small blades

Excavations of Neandertal artifacts at two caves in northern Spain have yielded an unexpected discovery—a trove of thin, double-edged stone blades that researchers usually regard as the work of Stone Age people who lived much later.

In 2005, Federico Bernaldo de Quiros of the University of León in Spain and his coworkers unearthed small stone blades, which they called bladelets, lying amid larger, characteristic Neandertal stone implements in a cave called El Castillo. All

the finds came from sediment that had previously been dated to 47,000 to 42,000 years ago. Later, the researchers found nearly identical bladelets in soil at another cave, Cueva Morin, which also contains 50,000-year-old Neandertal tools.

At both caves, Neandertals fashioned bladelets in a series of stone-cutting operations similar to those employed by *Homo sapiens* several thousand years later, Bernaldo de Quiros now proposes.

Similar breaks near the base of many Neandertal bladelets indicate that the implements were attached to handles of some kind, the Spanish investigator says.

The finds suggest that Neandertals were the intellectual equals of *H. sapiens*, at least in toolmaking, Bernaldo de Quiros says. Neandertals may have been nudged into the bladelet business by northern Spain's poor-quality rock, which is best suited for producing small tools. —B.B.

## OCCUPATIONS

## Digging up debate in a French cave

More than 50 years ago, Henri Delporte excavated a French cave known as Grotte des Fées at Châtelperron. He unearthed many large stone tools characteristic of Neandertals as well as a surprise: small, sharpened points seemingly made by the species toward the end of its evolutionary run. Archaeologists have attributed the finds, now known from several western European sites, to a final phase of Neandertal culture called the Châtelperronian.

Delporte's work has now sparked a heated row over interactions between Neandertals and modern humans. Paul Mellars of Cambridge (England) University says that other tools in the cave indicate that modern humans with a distinctive toolmaking style known as Aurignacian inhabited Grotte des Fées between occupations by Neandertals bearing Châtelperronian tools. In Mellars' view, modern humans spread into western Europe around 40,000 years ago and coexisted with Neandertals for 10,000 years, until the latter species died out.

Mellars and his coworkers identified artifact-containing soil layers at Grotte des Fées using Delporte's published reports and unpublished excavation records held in a French museum. Radiocarbon measurements of animal bones from each layer indicated that an initial Châtelperronian

occupation was from 40,000 to 39,000 years ago. Between roughly 39,000 and 36,000 years ago, Aurignacian material predominates, followed by a Châtelperronian return from about 36,000 to 34,500 years ago, Mellars holds.

Critics of Mellars' research, which was published in the Nov. 3, 2005 *Nature*, assert that Châtelperronian culture preceded Aurignacian culture by a few thousand years or more at Grotte des Fées and other sites, and that the two populations eventually met. Delporte, an inexperienced archaeologist at the time of his discoveries, inadvertently disturbed the positions of the few Aurignacian artifacts in the cave and left them scattered in deeper, older soil layers, contends Francesco d'Errico of the National Center for Scientific Research in Talence, France.

Delporte's accounts reveal that the original locations of artifacts and animal bones at the site weren't recorded. Also, because workers dug up mounds of soil and then dumped them back, sediment and artifacts from different layers are now mixed together. On closer inspection, even sediment identified as Aurignacian by Mellars' team contains mostly Châtelperronian tools, d'Errico says. —B.B.

## CULTURE

## Making sacrifices in Stone Age societies

Double and triple burials at 23,000-to-27,000-year-old sites in Europe and western Asia suggest prehistoric human sacrifices, says Vincenzo Formicola of the University of Pisa in Italy.

Of 30 known burials from that time period and area, 6 held more than one person. These graves contain two or three children, adolescents, or young adults apparently buried at the same time, positioned in curious ways, and accompanied by unusually valuable objects, Formicola says. Most of the multiple burials include at least one youngster with a deformity.

One of the graves, at Russia's 24,000-year-old Sunghir site, contains a boy and a girl buried head to head, dusted in red ochre, and ornamented with thousands of ivory beads, fox-teeth pendants, and pierced antlers. Spears carved out of mammoth tusks lay next to the children. The Stone Age girl displayed severely bowed legs that would have limited her mobility.

It would have taken months to produce all the items interred with the two youngsters, Formicola says. "Was the burial of these children foreseen long in advance?" he asks. "It raises the possibility of [prehistoric] human sacrifices." —B.B.



# Books

A selection of new and notable books of scientific interest

## SEED TO SEED: The Secret Life of Plants

NICHOLAS HARBERD

In brief diary entries spanning 2004, Harberd reveals his passion for botany as he details his observations of thale-cress—lab scientists'



favorite plant—in its natural habitat in an English cemetery. He describes not only the genetics of the species but also its beauty within its ecological niche. Throughout the book, Harberd includes evocative musings on nature as a whole, commenting, for instance, on the differences in the light encountered in California versus that in his native England and on the slow attack of a slug on a plant. The scientist also includes explanations of cell division and genetics detailed enough to discuss mRNA and stop codons. Illustrated with more than 40 black-and-white sketches, this is an illuminating glimpse of a dedicated scientist at work. **Walker, 2006, 320 p., b&w images, hardcover, \$24.95.**

## WINDOWS ON NATURE: The Great Habitat Dioramas of the American Museum of Natural History

STEPHEN CHRISTOPHER QUINN

In some ways, the displays are even better than zoo exhibits. Everything looks perfectly real, but since the mounted animals don't move or hide, a visitor



can study them much more closely than a zoo typically allows. This book is a history of the exhibits at the American Museum of Natural History in New York City and of the art and science of habitat dioramas.

Carl Akeley built the first animal diorama at the Milwaukee Public Museum in 1889 and later created many of the American Museum's dioramas. The hall there containing the African animals today bears his name. Quinn, the long-time project manager for the museum's exhibitions, examines many of the New York museum's dioramas in detail through text and multiple color and archival photographs. Sections describe taxidermy and profile several taxidermists and artists who have worked on the dioramas. **Harry N. Abrams, Inc., 2006, 180 p., color illustrations and photographs, hardcover, \$40.00.**

## WHO CONTROLS THE INTERNET? Illusions of a Borderless World

JACK GOLDSMITH AND TIM WU

The authors contend that over the past few years, the Internet has transformed from a lawless, borderless frontier to a territory under the influence of governmentlike regulations. Law professors Goldsmith and Wu outline how early court cases, such as one pitting the French government against Yahoo, challenged the notion that the Internet couldn't be governed by national laws. They detail how the Internet, once a tool of computer insiders, became an international phenomenon reflecting

the customs and languages of people worldwide. They explain how file sharing, online auctions, and other types of Internet commerce were refined and developed in accord with copyright laws and other real-world constrictions. The authors don't pine for cyber anarchy. Instead, they say that with the glaring exception of censorship by a few restrictive governments, the

Internet has turned out to be a valuable source of

information and place of safe commerce for whoever logs in. **Oxford, 2006, 240 p., b&w photos, hardcover, \$28.00.**

## WHAT TO EAT: An Aisle-by-Aisle Guide to Savvy Food Choices and Good Eating

MARION NESTLE

Navigating the aisles of warehouse-size supermarkets and making sense of increasingly complicated nutrition labels can bewilder many a food shopper. With this comprehensive guide, Nestle, a nutritionist, makes the weekly trip to the grocery less daunting and a healthy diet more attainable. She

traverses each section of today's

supermarket: produce, dairy, meat, fish, and the center aisles (where most of a store's profit is made). She outlines how to make informed, safe, and nutritious selections. She describes the differences between organic and conventional produce, the hidden politics of dairy foods, the health claims behind soy products, and the dangers of *trans* fats. She also details the threat of mercury in seafood and discusses how to balance that danger against the health-giving promise of omega-3 acids in fish. From caffeine to infant formula to herbal supplements, Nestle comments on foods that factor into people's lifestyles and determine their health. **North Point Press, 2006, 624 p., hardcover, \$30.00.**

## THE DEVIL'S DOCTOR: Paracelsus and the World of Renaissance Magic and Science

PHILIP BALL

Philip Theophrastus Aureolus Bombast von Hohenheim, also known as Paracelsus, was a 16th-century man who, despite venomous derision from scientists and physicians who came after him, made important contributions to modern science. He inspires mixed feelings in historians because of his bombastic style—he often invented

words to sound more impressive—and his belief in

the occult. However, Ball paints an objective portrait of this complicated figure by outlining the nature of intellectual inquiry in Europe during the period in which Paracelsus lived and worked. Many of Paracelsus' ideas are now recognized as misguided. For instance, he recommended sulfuric acid as a treatment for epilepsy and syphilis. Nevertheless, Ball declares the man a visionary for his time. Ball describes Paracelsus' use of alchemy's techniques to develop medicines. He also outlines Paracelsus' penchant for astrological prognostication instead of astronomy and his rumored battles with mental illness. Ball creates a fascinating picture of late-medieval Europe and its incubation of modern medicine and chemistry. **Farrar, Straus, and Giroux, 2006, 448 p., b&w illus, hardcover, \$26.00.**

# LETTERS

## Now hear this

Unless the writer is deliberately implying an archaic theory of evolution in "Can you hear me now? Frogs in roaring streams use ultrasonic calls" (*SN: 3/18/06 p. 165*), the statement "Ultrasonic perception may have developed as the frogs (*Amolops tormotus*) struggled to hear each other ..." cannot be true. That's not how natural selection works. JOHN WYMORE, ALBUQUERQUE, N.M.

*Frogs that could hear frequencies higher than the water's roar might have had an advantage. "Struggled to hear each other" shouldn't be interpreted as "struggled to evolve." Indeed, evolution doesn't work that way.* —S. MILIUS

## No direction home?

In "Unique Explosion: Gamma-ray burst leads astronomers to supernova" (*SN: 3/4/06, p. 133*), the author states that the observed supernova was "one of only a handful ... heralded by a burst of gamma rays." Isn't that because gamma-ray bursts from core-collapse supernovas are directional, along the axis of rotation? Was GRB 060218 "unique" because it produced a burst of gamma rays or because its axis was pointed our way? PETER WILSON, SIMI VALLEY, CALIF.

*Gamma-ray bursts are directional, but less than 1 percent of supernovas are associated with gamma-ray bursts. Moreover, the supernovas are fainter, and therefore harder to detect, than gamma-ray bursts. That's why only a few of these supernovas have been detected.* —R. COWEN

## Say no to drugs

I wouldn't allow a child of mine to receive SSRIs for treatment of depression, unless that depression were truly crippling and my child required inpatient care and a 24-hour suicide watch ("Prescription for Controversy," *SN: 3/18/06, p. 168*). The marginally lower effect of talk therapy alone, while presenting half the risk of committing suicide and imposing no unknown long-term pharmacological side effect, makes this decision a no-brainer to me. DAVID P. VERNON, TUCSON, ARIZ.

**Corrections** "Buried Treasures" (*SN: 4/29/06, p. 266*) had it backwards about the acidity of water seeping into a cave. Water becomes less acidic when it enters a cave and outgases carbon dioxide. Also, the mineral formations called soda straws can grow to lengths of several meters, not several centimeters.

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