

# SCIENCE NEWS

THE WEEKLY NEWSMAGAZINE OF SCIENCE

crested forefather of *t. rex*  
gaggle of gamma-ray bursts  
civil war vets' mental toll  
low-fat diet disappoints

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# SCIENCE NEWS

FEBRUARY 11, 2006 VOL. 169, NO. 6

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SCIENCE NEWS is printed in the United States on process chlorine-free paper containing 90% recycled fiber with 30% postconsumer waste.

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**Cover** Brain-damaged patients can experience strange alterations of self-knowledge. Investigations of such cases and of brain activity during normal self-recognition suggest that the right brain orchestrates the sense of "I." But it's still unclear how the brain fosters one's ability to distinguish oneself from others. (Artville) [Page 90](#)

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*Science News* (ISSN 0036-8423) is published weekly on Saturday, except the last week in December, for \$54.50 for 1 year or \$98.00 for 2 years (foreign postage is \$18.00 additional per year) by Science Service, 1719 N Street, N.W., Washington, DC 20036. Preferred periodicals postage paid at Washington, D.C., and an additional mailing office.

### POSTMASTER

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### Ancestor of Kings

#### Early progenitor of *T. rex* had a crest

Paleontologists have unearthed remains of the oldest known dinosaur of the tyrannosaur clan. About 160 million years ago, the agile, 3-meter-long predator roamed what is now northwestern China. Its fossils bolster a recent theory about the evolutionary origins of the fearsome meat eaters that appeared later.

Dubbed *Guanlong wucaii*, which in Mandarin means “crowned dragon from the five-colored rocks,” the newly described creature gets its genus name from the distinctive, 6-centimeter-tall crest that runs along the top of its snout, says James M.

Clark, a vertebrate paleontologist at George Washington University in Washington, D.C.

The dinosaur shares several traits with *Tyrannosaurus rex*, which lived about 95 million years later. Both beasts sported front teeth with U-shaped cross sections, nasal bones fused for strength, and an ornamented skull.

In the Feb. 9 *Nature*, Clark and his colleagues describe two sets of nearly complete remains representing *G. wucaii*. One set is of an adult estimated to be 12 years old, and the other is of a juvenile about 6 years of age. Although both creatures sported a crest, on the younger dinosaur that feature was small. In both the adult and the juvenile, the bony structure is largely hollow and doesn't appear to be directly connected to the creature's nasal passages.

The crest was too fragile to have served an offensive or defensive function and “only makes sense in terms of visual signaling,” says Clark. The structure might have distinguished one sex of the species from another, been a sign of sexual maturity, or enabled *G. wucaii* to recognize other members of its species at a distance. Some scientists have speculated that the bizarre anatomical features of many other dinosaurs served similar purposes (*SN*: 8/13/05, p. 103).

Tyrannosaurs were noted for their short snouts, sturdy skulls ornamented with knobs and ridges, and puny, two-fingered arms. *T. rex* stood 4 m tall at the hips, stretched nearly 13 m from its snout to the tip of its tail, and had teeth the size of bananas.

Paleontologists once thought that tyrannosaurs had evolved from large predators that lived at the end of the Jurassic period, 145 million years ago. However, a decade ago, scientists began to speculate that *T. rex* and its cousins evolved much earlier, from a line of small, meat-eating coelurosaurs. Fossils show that these creatures shared many skeletal features with tyrannosaurs.

The remains of *G. wucaii*, the first tyrannosaur relative known to be more than 130 million years old, support the latter theory, says Thomas R. Holtz Jr., a paleontologist at the University of Maryland, College Park.

Not only did *G. wucaii* share traits with the tyrannosaurs, but it also had coelurosaur-like features, including a relatively long snout, bladelike teeth on the sides of its jaws, and long arms with three-fingered, grasping hands, says Holtz.

Although *T. rex* and the other large, relatively recent tyrannosaurs were undoubtedly the rulers of their ecosystems, *G. wucaii* didn't reign in its era. It had to be agile not only to catch prey but also to escape from predators about twice its size that lived in the area, says Clark. —S. PERKINS

### Beyond Bar Codes

#### Tuning up plastic radio labels

Electronic labels made from plastic semiconductors can now pick up and respond to radio signals at a frequency suitable for use on products. At an electronics conference in San Francisco this week, two European industrial-research teams described plastic radiofrequency-identification (RFID) prototypes with those advanced capabilities.

Although silicon-based RFID tags are already in wide use—for instance, in so-called smart cards used to pay mass-transit fares—the new developments bring closer the prospect of RFID tags becoming as common as bar codes, or perhaps even more so, the researchers say. Besides labeling consumer products, plastic tags might make novel electronic tracking and transactions possible, from computer monitoring of what's in the refrigerator to mail routing by means of smart address labels.

To make that leap, tags must become much less expensive than is possible if they're made of silicon. Hence, the move to plastic.

Until recently, developers of all-plastic tags have turned out only low-frequency devices. Mainly because of bulky antennas, they're unsuited for consumer applications. However, some engineers have created components that operate at high frequencies, such as the plastic diode reported last year by researchers in Belgium (*SN*: 8/13/05, p. 100).

At the 2006 IEEE International Solid-



**JUST FOR SHOW?** *Guanlong wucaii*, the oldest known species in the tyrannosaur lineage, sported a 6-centimeter-tall crest that ran along the top of its snout.



State Circuits Conference, researchers from the Netherlands unveiled an all-plastic device that operates at the sought-after, industry-standard frequency of 13.56 megahertz (MHz). When queried via radio waves by a nearby gadget known as a reader, the device responds with an eight-bit code, says Eugenio Cantatore of Philips Research Laboratories in Eindhoven.

"It's not just one or two elements that we've proven in the lab. We've proven the entire thing," says Philips' engineer Leo Warmerdam.

In another talk at the conference, Markus Böhm of the company PolyIC in Erlangen, Germany, described an experimental 13.56-MHz tag that PolyIC produced last fall. This device sends back just one bit of information. "It's just a very simple signal saying 'I'm here,'" says PolyIC physicist Wolfgang Clemens.

The Philips researchers made their device from the plastic pentacene and exploited its property of increasing the speed of electricity's flow—and therefore the device's frequency—when the voltage is raised.

The PolyIC team used a different plastic and formed it into a diode similar to the one invented in Belgium. Because the diode contains thin layers, electric charges have short distances to travel and the circuit operates quickly, Clemens explains.

Despite such progress, many hurdles remain before plastic RFID tags will show up in supermarkets or mailboxes. For instance, neither team used printing technology to make its device—a must for inexpensive production. Also, neither tag broadcasts its signal more than a few centimeters.

Still, each of the new devices "constitutes an advance toward making a manufacturable RFID tag," comments Klaus J. Dimmler of Organic ID in Colorado Springs, Colo. —P. WEISS

## Combat Trauma from the Past

### Data portray Civil War's mental, physical fallout

Thanks to extensive military and medical records for Union Army veterans of the U.S. Civil War, a research team has determined that soldiers who saw many of their comrades killed or who were prisoners of war experienced a greater incidence of serious

physical and mental ailments later in life and died at younger ages than other veterans did.

The link between harrowing combat experiences and various postwar illnesses and death was strongest among younger groups of soldiers, reaching a peak in those who had enlisted between ages 9 and 17, say Judith Pizarro of the University of California, Irvine and her colleagues.

"Many psychological symptoms of Civil War veterans look a whole lot like post-traumatic stress disorder (PTSD), but we couldn't assign that diagnosis to individuals based on this data," says Irvine psychologist and coauthor Roxane Cohen Silver.



**UNCIVIL AILMENTS** Nineteenth-century medical records indicate that young Civil War soldiers, such as 18-year-old private Welcome E. Stillman of New York's 114th Regiment, Company H, often developed mental and physical problems after experiencing war traumas.

The new findings appear in the February *Archives of General Psychiatry*.

The psychologically tumultuous postwar lives of Civil War combat veterans strikingly resemble the lives of Vietnam combat veterans, who have high rates of mental disorders, remarks psychiatrist Roger K. Pitman of Massachusetts General Hospital in Charlestown.

PTSD typically includes intrusive thoughts or dreams about a life-threatening event, avoidance of reminders of the event, social withdrawal, and a sense of being on constant alert for danger.

To study combat's lasting effects on those who survived the Civil War, Pizarro's team analyzed a previously assembled computerized database. It includes medical records and reports of physical examinations of Civil War veterans conducted during their postwar lifetimes. For 15,027 randomly selected recruits, these records were matched to military records in the same database. Ages at enlistment ranged from 9 to 71. All veterans in the study survived until at least 1890.

War trauma, indicated by heavy casualties in a soldier's company or having been a prisoner of war, moderately increased veterans' chances of developing gastrointestinal, cardiac, or mental ailments, the researchers say. The same experiences greatly increased the chance of developing a combination of mental and physical illnesses.

Civil War veterans who had been wounded exhibited a high rate of psychological problems but relatively little physical disease, perhaps because only particularly hardy individuals survived battlefield injuries, Silver suggests.

Pitman "strongly suspects" that PTSD afflicted many Civil War veterans. One piece of evidence is the heightened risk of psychiatric problems among the youngest soldiers. Recent research finds that brain areas that regulate emotion and deal with the aftermath of trauma don't mature until young adulthood, Pitman says.

The Civil War undoubtedly devastated the lives of surviving soldiers, says historian and attorney Eric T. Dean Jr. of New Haven, Conn. "But it's hard to make fine-grained conclusions, such as those in this new study, based on primitive medical notes and observations from the 19th century," says Dean, who previously examined psychological records of Civil War veterans from Indiana.

More Civil War soldiers died from disease that spread through crowded camps than from battle wounds, he adds. Heavy casualties in a company thus might predominantly reflect disease, not fighting, as Pizarro's team had assumed. —B. BOWER

## Males as Nannies?

### First test for wasps' hidden baby-care skills

If scientists kidnap all adult females from a wasp nest, the young males—which normally just hang around without working—will pitch in and feed at least some of the larvae, researchers find. This shows that male wasps have the wherewithal to do a job.

The scientists removed female workers from the nests of the southern Indian wasp *Ropalidia marginata*. The study is the first systematic test of job skills in a social bee or wasp, says Raghavendra Gadagkar of the Indian Institute of Science in Bangalore.

With help from Gadagkar's colleague Ruchira Sen, the males came through. However, they fed larvae "less efficiently" than the regular nursemaids do, Gadagkar and Sen report in the February *Animal Behaviour*.

In the bees, wasps, and other social insects of the order Hymenoptera, females feed the young, hunt, and serve as soldiers. Males get their meals delivered and just



wait around until it's time to find a female to fertilize. In contrast, young male termites work along with their sisters.

In a few wasp species, biologists have on occasion observed males giving food to larvae.

The researchers brought 14 wasps' nests into the lab. To make sure that the test wasps had enough to eat, Sen set dishes of food just outside the nests. In colonies where she had removed the females, the males didn't go out to eat. Sen "mastered the art of patiently and tenderly hand-feeding the males," says Gadagkar.

Males that Sen fed did some larva nannying, although not in the standard ways. They spent much longer than females do in preparing the food by chewing it into mush. During the chewing, a nursemaid drinks some of the juices before passing along the infant's meal. Gadagkar and Sen are now testing whether the males siphon off a bigger share of the baby food than regular nursemaids do.

The males gave food only to the bigger, older larvae rather than to all larvae, as females do. The youngest larvae may be tricky to feed, Gadagkar speculates. The older larvae can more easily grab food.

The males also skipped steps in the feedings. After providing the chewed-up mush, a regular nursemaid takes a break to groom herself, then returns to the larva and regurgitates liquefied food and saliva for it. The males just groomed themselves and moved on. Nor did males make the females' gestures of fanning their wings and drumming their antennae against the larvae's cells.

"It's quite an interesting finding because they test hypotheses about not just what males do but what they can do under certain circumstances," says insect behaviorist Samuel Beshers of the University of Illinois at Urbana-Champaign.

The experiment is "a clever idea," comments Sean O'Donnell of the University of Washington in Seattle, who has studied male roles in wasp colonies. "The question of why there are not male workers [among social Hymenoptera] is an important and unresolved one," he says. —S. MILIUS

## Low-Fat Diet Falls Short

### It's not enough to stop cancers, heart disease

Reducing fat consumption after menopause offers most women little if any protection against breast cancer or several other dis-

eases, according to three reports from a massive prevention trial. No significant differences in rates of colorectal cancer, heart disease, or stroke emerged during the trial.

But "little snippets of information" from the Women's Health Initiative (WHI) trial suggest that cutting back on fats may protect some women from breast cancer, says epidemiologist and study investigator Shirley Beresford of the University of Washington in Seattle. She was among nearly 50 investigators who worked on the trial.

For example, one segment of the new data suggests that switching and sticking closely to a low-fat diet prevents breast tumors in women who previously ate especially large amounts of fat. People with "bad diets" have the most to gain, says epidemiologist Barbara Howard of the nonprofit MedStar Research Institute in Hyattsville, Md., another of the trial's investigators.

The data also suggest that the dietary switch may block a particularly aggressive form of breast cancer.

Past studies had suggested that people who eat relatively little fat and plenty of fruits, whole grains, and vegetables are at reduced risk for breast and colorectal cancers and heart disease.

The gold standard of diet research is an intervention trial, in which some volunteers are directed to change the way they eat and, for comparison, others maintain their established eating habits. The WHI is the largest dietary-intervention trial ever conducted. It ran from 1993 to 2005 and included nearly 50,000 postmenopausal women, ages 50 to 79, who initially consumed an estimated 32 percent or more of their calories in fat.

Two-fifths of the volunteers were asked to switch permanently from their normal diet to one low in fat and high in fruits, vegetables, and grains. Nutritionists then saw those women at least four times per year and encouraged them to adhere to the regimen.

The average fat intake was 8.1 percent lower among women in the low-fat group than among women maintaining a normal diet. Even so, only 14 percent of women in the low-fat-diet group met the researchers' target of reducing fat consumption to 20 percent or less of total caloric intake.

During the 8 years, on average, that women spent on the low-fat diet, 0.42 percent of that group developed breast cancer each year. In the regular-diet group, cancer

incidence was nearly identical, 0.45 percent per year.

However, women in the low-fat group were 24 percent less likely, compared with other women, to get the aggressive form of breast cancer, says biostatistician Ross Prentice of the Fred Hutchinson Cancer Research Center in Seattle, who was a trial leader.

Furthermore, says Prentice, the women who adhered most closely to the diet had a 15 percent reduced risk of breast cancer overall, compared with the normal-diet group.

The current results appear in three reports in the Feb. 8 *Journal of the American Medical Association*.

The researchers will monitor the volunteers' health through at least 2010.

Recommending a low-fat diet and providing nutritional counseling to postmenopausal women aren't enough to alter the risk of breast cancer, colorectal cancer,



**WASP WORKS** In a colony of Indian paper wasps, females do the work even though, in a pinch, young males can feed the older larvae.



## Found: A missing hot halo

X-ray observations of the massive spiral galaxy NGC 5746 reveal a spherical halo of hot gas (blue) extending 60,000 light-years on either side of the galaxy's visible disk (seen edge on as a large white streak). Because NGC 5746, which is 100 million light-years from Earth, doesn't form stars prodigiously or have an energetic core, it's not likely that the halo is gas streaming from the galaxy. Instead, it's probably composed of inflowing material left over from the galaxy's formation. NASA's orbiting Chandra X-ray Observatory recorded the halo, and the galaxy's disk was captured by a visible-light telescope on Earth. Although galaxy-formation models have predicted halos of inflowing gas around massive spirals, this is the first such halo that astronomers have detected. NASA released the image on Feb. 3. —R. COWEN



and cardiovascular disease in women who may have had an above-average fat intake for more than 40 years, Beresford says. She adds, "Changing dietary behavior at younger ages makes a lot of sense."

By emphasizing cuts in total fat intake, the intervention diet "also reduced what you might think of as protective fats," such as unsaturated oils, comments epidemiologist Cheryl Anderson of the Johns Hopkins Medical Institutions.

Although they weren't instructed to lose weight, women who changed diet weighed on average 0.8 kilogram (2 pounds) less after 6 years than the other women did. "Had weight come down more [among dieting women], we might have seen some effects on cardiovascular disease," says Anderson. —B. HARDER

## Changing Priorities

### Bush initiative shifts science-budget funds

President Bush's proposed fiscal year 2007 budget would keep overall research-and-development (R&D) spending at current levels and shift funds to the three agencies critical to a White House initiative to maintain U.S. leadership in science and technology.

The \$2.77 trillion spending plan includes \$137 billion for R&D in 2007. While this number is up more than \$3 billion from the spending estimate for 2006, the actual gain when adjusted for the predicted inflation rate of 2.2 percent is only 0.4 percent. "In general, the science budgets this year are flat, except for increases in selected high-priority agencies," says John H. Marburger III, director of the federal Office of Science and Technology Policy.

The American Competitiveness Initiative, announced in the President's State of the Union address last month, seeks to bolster basic and applied research in fields that are at the center of such advances as the Internet, fiber optics, and satellite-telecommunications systems. The three agencies that Bush has selected as crucial for the initiative are the National Science Foundation (NSF), the Department of Energy's Office of Science, and the National Institute of Standards and Technology (NIST).

NSF's entire 2007 budget of \$6.02 billion would be part of the competitive initiative,

and \$4.5 billion of that sum would be put toward R&D. NSF Director Arden L. Bement Jr. says that he expects the increased funding to support as many as 500 new research grants primarily in the physical sciences. Most NSF programs to strengthen K-12 education in science, engineering, and math would also increase.

"As other countries begin to emulate our innovation systems, they are going to become more competitive, and that could put us at a serious disadvantage," Bement says. "So, we have to take new concepts and put them to work."

As part of the initiative, the Department of Energy's Office of Science budget would rise from \$3.6 billion in 2006 to \$4.1 billion. The office would spend half the money on research and half for operating its scientific facilities, such as the Relativistic Heavy Ion Collider at the Brookhaven National Laboratory.

NIST would receive a \$72 million increase in funding for research at its facilities.

But the increases related to the initiative are offset by cuts at other research agencies, notes Kei Koizumi, director of the R&D Budget and Policy Program at the American Association for the Advancement of Science in Washington, D.C.

Biomedical research, for instance, would take a hit in 2007, as it did in 2006. The National Institutes of Health would gain \$18 million, but that translates into a 2.1 percent decrease in support when adjusted for inflation. NIH estimates that fewer than one out of every five grant applications will be funded in 2006 and 2007. "That's strikingly low," says Koizumi, noting that about one of every three grants succeeded in 2001.

Furthermore, the Department of Agriculture and the Environmental Protection Agency were scheduled for severe cuts.

At other agencies, however, "if you are a non-biomedical scientist applying for a grant, then the news looks pretty good, especially in the physical sciences and engineering," says Koizumi.

As in other recent budgets, the largest slice of the R&D pie would go to the Department of Defense. They would get an additional \$2.3 billion, which is a 1 percent increase over 2006. The R&D budget for the Department of Homeland Security, which enjoyed an increase of roughly 21 percent last year, would see a 0.6 percent decrease in 2007.

NASA R&D would collect \$851 million, or 5.2 percent more than it did last year, for a total of \$12.2 billion. The agency's overall budget, however, would cut science and aeronautics programs to make up for a \$3 billion shortfall in other areas. That shortfall comes in part from finishing the assembly of the International Space Station, and building a vehicle that would take astronauts back to the moon and pave the way for a venture to Mars.

The President's budget sets aside about \$150 million for a proposed shuttle flight to repair the aging Hubble Space Telescope. The agency also proposes \$443 million for building the James Webb Space Telescope, Hubble's proposed successor.

The overall lack of growth in federal R&D is not surprising, considering the President's intention to reduce domestic spending, says Koizumi, and "in that situation, an increase in one area has to come out of another area." —A. CUNNINGHAM

### R&D Budget (in millions of dollars)\*

AGENCY OR DEPARTMENT	FY 2005 ACTUAL	FY 2006 ESTIMATE	FY 2007 PROPOSED	PERCENT CHANGE 2006-2007
Defense	69,743	71,946	74,234	1.0
NIH	28,444	28,410	28,428	-2.1
NASA	10,197	11,394	12,245	5.2
Energy	8,596	8,563	9,158	4.6
NSF	4,138	4,199	4,548	6.0
Agriculture	2,410	2,411	2,012	-18.3
Commerce	1,133	1,079	1,065	-3.4
Homeland Security	1,182	1,484	1,508	-0.6
Interior	622	637	600	-7.8
EPA	640	600	557	-9.2
Other	2,769	3,058	2,849	-8.8
<b>Total</b>	<b>129,874</b>	<b>133,781</b>	<b>137,204</b>	<b>0.4</b>

\*Adapted from Office of Management and Budget; figures reflect rounding.

†Adjusted for 2.2 percent expected rate of inflation.



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AG2HR



# BLASTS FROM THE PAST

Astronomers begin to go the distance with gamma-ray bursts

BY RON COWEN

Just before 10 p.m. EDT, last Sept. 3, Dan Reichart's cell phone started playing "The Stars and Stripes Forever." A fitting tune, since it was heralding a call from the heavens. Reichart's phone was signaling that a detector on NASA's Swift satellite had registered a gamma-ray burst, the most powerful type of explosion in the universe. Such bursts—none of which lasts longer than a few minutes—typically mark the violent death of a massive star as it collapses to become a black hole.

Since its launch in late 2004, the Swift satellite has recorded more than 100 gamma-ray bursts. About 20 other detections have turned out to be spurious. Reichart, an astronomer based at the University of North Carolina at Chapel Hill, didn't want to miss an opportunity to find the new burst's afterglow. With most of his team at a seminar on a remote island in Greece, Reichart immediately contacted his only available student, undergraduate Josh Haislip. They needed to take control of several mountaintop telescopes in Chile within 3 hours. That's when the afterglow, deep in the constellation Pisces, would lie directly overhead in the southern night sky, and detectors would have their best view.

Although gamma-ray bursts are absorbed by Earth's atmosphere, their afterglows shine at wavelengths, ranging from visible light to radio, that can be recorded at ground level. What's more, an afterglow can last for hours or days, providing critical information on the collapsing star's location, the nature of the galaxy from which the burst arose, and the composition of the interstellar material through which the radiation passed on its long journey to Earth.

Nearly all the afterglows that astronomers have detected come from gamma-ray bursts that arose in galaxies that lie 2 billion to 8 billion light-years away. But a few recently detected afterglows hail from much more-remote depths of space (*SN: 9/17/05, p. 179*). Since peering deeper into space is the same as looking farther back in time, finding such distant flashes of light "will likely drive a new era in the study of the early universe, using the bursts as probes," Reichart says.

With recently launched spacecraft such as Swift and the High Energy Transient Explorer pinning down the location of a multi-

tude of bursts, Reichart has made a bold prediction. Within the next 2 years, he says, astronomers will document gamma-ray bursts and their afterglows at distances more remote than those of the galaxies and quasars that now are the most-distant light-emitting objects known.

Gamma-ray bursts are about to open a new frontier in cosmology, says theorist Avi Loeb of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

**THEN CAME LIGHT** Gamma-ray bursts offer great promise for studying the era when the first stars formed and flooded the universe with light, Loeb says. Astronomers still have only the vaguest of notions about how and when the universe emerged from darkness.

The cosmic Dark Ages began a few hundred thousand years after the Big Bang, when the radiation left over from the birth of the universe had faded and the cosmos had cooled enough for electrons and protons to combine into neutral atoms of hydrogen. Soon, some of the hydrogen atoms began gathering into the clouds that produced the first generation of stars.

But the universe as a whole stayed dim. Hydrogen atoms readily absorbed much of the light generated by new, massive stars. It was only after these stars generated enough ultraviolet radiation to break apart, or ionize, the hydrogen atoms that the light could shine through and illuminate the cosmos.

That illumination was a gradual process, as Loeb and his colleague Volker Bromm of the University of Texas at Austin envision it. At first, the ultraviolet light from the young stars created small bubbles of ionized gas in their immediate surroundings. Only when the bubbles from individual stars or groups of stars began overlapping could the light from this first stellar generation shine through.

Gamma-ray bursts are the ideal tools to study the transition from a dark universe filled with neutral hydrogen atoms to a shining cosmos containing an abundance of ionized atoms, says Loeb. For starters, these explosions were likely to have been common in the early universe, he notes. Computer modeling suggests that the first stars were extremely massive—so heavy that most of them died out rapidly and violently, collapsing into black holes several times as heavy as the sun while generating gamma-ray bursts.

Hydrogen from the Dark Ages left its fingerprints on a variety of bright beacons from that early era, including the afterglow of



**BIG BOOMS** — Information about the first stars (illustrated here) may come from gamma-ray bursts and their afterglows, which are so bright that telescopes can see some that occurred in the first stellar generation, less than a billion years after the birth of the universe.



gamma-ray bursts. A neutral hydrogen atom absorbs a specific wavelength of light passing through it. If light from the afterglow of a gamma-ray burst travels through a region of such atoms, it exhibits a gap in its spectrum.

By analyzing the spectrum of light from a distant afterglow, astronomers are attempting to determine the ionization state of gases in the early universe. Even if only 1 in 100,000 atoms of hydrogen in a patch of space were neutral, all the light at this wavelength would be blocked, and observers examining the spectrum would see the gap.

**BURST VERSUS QUASAR** Researchers have already recorded the telltale gap caused by atomic hydrogen in the spectrum of another type of bright beacon, known as a quasar (*SN: 8/11/01, p. 84*). For more than 3 decades, astronomers have used quasars to study the composition of the intergalactic material that these beacons pass through en route to Earth. Each chemical element, depending on its location, creates a different bump or wiggle in the quasar spectrum. The spectra of distant quasars have revealed, for example, that carbon and other metals had formed by the time the universe was less than one-fifth its current age.

Whereas afterglows of gamma-ray bursts last only hours or days, quasars shine for millions of years. However, the much shorter duration of an afterglow from a gamma-ray burst may offer an advantage, note Reichart and cosmologist Don Lamb of the University of Chicago. Quasars last so long that they can disturb their immediate surroundings and create clouds of ionized hydrogen gas within a region that would otherwise be neutral. So, instead of acting as a passive probe of hydrogen at the end of the Dark Ages, as a gamma-ray burst would, a distant quasar may primarily be revealing its own capacity to break apart hydrogen atoms.

Moreover, the typical gamma-ray afterglow is about 100,000 times as bright as a quasar, providing astronomers with a more penetrating beacon that can, in theory, be seen farther back in time.

Distant bursts may also be more plentiful than distant quasars. Gamma-ray bursts require only a black hole roughly the mass of a single star, Lamb notes, and the early universe was apparently chockfull of such small black holes. In contrast, quasars require millions to billions of stars combining to create a supermassive black hole. Few if any of these black holes are likely to have existed when the universe was only a few hundred million years old.

Furthermore, he notes, bursts—unlike quasars—tend to come from small, run-of-the-mill galaxies. Gamma-ray bursts, therefore, shine a light on what may be the Joe Average galaxies in the early universe, from which most of the stars were formed, rather than on the rarer beasts that form quasars.

There's one other property that makes distant gamma-ray bursts better tools than quasars for looking at the early cosmos, says Loeb. For the steady light of a quasar, the greater the distance and the farther back in time that the light was emitted, the fainter it appears. But gamma-ray afterglows aren't steady; they're brightest immediately after a burst and then they fade rapidly.

In a phenomenon consistent with Einstein's theory of general relativity, the afterglow from a distant gamma-ray burst takes longer to fizzle out than does the afterglow of a nearby burst. Therefore, astronomers have more time to record the brightest afterglow of a distant gamma-ray burst.

All in all, "this is a great time to study distant gamma-ray bursts," said Loeb at a meeting on gamma-ray bursts in Washington, D.C., last December. "There are a lot of question marks about what really happened [in the early universe], and bursts may be a great tool to answer them."

**A CHASE PAYS OFF** Back at his laboratory in Chapel Hill, 3 hours had elapsed since Reichart's cell phone had announced a gamma-ray burst. Via the Internet, he had taken the controls of a pair of small telescopes that his team had built at the Cerro-Tololo Inter-American Observatory in Chile, pointing them at the patch of sky from which the burst had emanated. Each telescope views the sky at a different wavelength of visible light.

Reichart and Haislip had also arranged for a larger, infrared telescope on the adjacent Chilean mountaintop Cerro Pachon to hunt for the same afterglow. By chance, Haislip had just finished learning how to analyze data from the instrument, known as SOAR (Southern Observatory for Astrophysical Research). The researchers immediately found something odd. The afterglow appeared bright in the infrared, but the visible-light telescopes didn't detect it. A larger telescope at Palomar Observatory near Escondido, Calif., also failed to detect visible light.

That pattern of brightness in the infrared and of darkness in visible light had two possible explanations, Reichart knew. The more likely one was that the light came from a nearby but dusty galaxy, in which the dust had absorbed visible light and reemitted it in the infrared.

But there was a more intriguing possibility. The burst might have come from one of the most distant galaxies in the universe, providing a glimpse of the cos-

mos as it emerged from its Dark Ages.

Further observations indicated that the visible-light cutoff was abrupt and that the glow remained bright over a range of infrared wavelengths, properties that only a remote galaxy could reproduce.

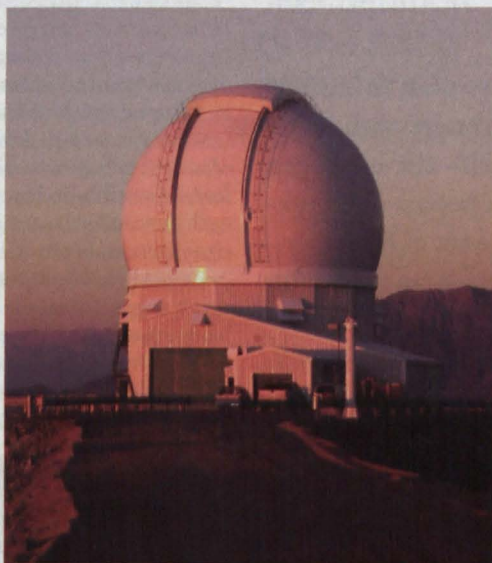
Without a spectrograph, Reichart's team could only estimate that the afterglow that they had found had been emitted from a galaxy less than a billion years after the Big Bang. The astronomers posted their finding on an Internet site devoted to the study of new bursts.

"We were a little nervous because this was a big deal, and we didn't want to put out something out we'd have to retract," says Reichart.

Three nights later, Japanese astronomers using the large, near-infrared Subaru Telescope on Mauna Kea in Hawaii finally obtained a spectrum of the ember. The spectrum indicated the redshift of the light, a measure of the extent to which the expansion of the universe had shifted the radiation to longer, or redder wavelengths. The more distant an object, the greater its redshift.

The Japanese team found that the afterglow had an unusually high redshift of 6.29, indicating that the burst had erupted in a galaxy 12.8 billion light-years away and dated to less than 900 million years after the Big Bang. The spectra confirmed that Reichart's team had broken the record, finding the most distant gamma-ray burst ever discovered. The previous confirmed record holder, discovered on Jan. 31, 2000, resided 500 million light-years closer to Earth. Only a few other known objects—a handful of remote galaxies and one quasar—are more remote.

After reading the e-mail announcement from the Subaru team, Reichart grabbed a yardstick from his laboratory and ran into the hallway of the physics building. Pointing the yardstick at anyone who passed by, he shouted, "6.29, 6.29!" ■



**GOING THE DISTANCE** — Using the near-infrared SOAR telescope in Chile, astronomers discovered the afterglow of the most distant gamma-ray burst yet found, some 12.8 billion light-years from Earth.



# SELF-SERVE BRAINS

Personal identity veers to the right hemisphere

BY BRUCE BOWER

**T**he concept of identity theft assumes an entirely new meaning for people with brain injuries that rob them of their sense of self—the unspoken certainty that one exists as a person in a flesh-bounded body with a unique set of life experiences and relationships. Consider the man who, after sustaining serious brain damage, insisted that his parents, siblings, and friends had been replaced by look-alikes whom he had never met. Everyone close to him had become a familiar-looking stranger. Another brain-injured patient asserted that his physicians, nurses, and physical therapists were actually his sons, daughters-in-law, and coworkers. He identified himself as an ice skater whom he had seen on a television program.

The sense of “I” can also go partially awry. After a stroke had left one of her arms paralyzed, a woman reported that the limb was no longer part of her body. She told a physician that she thought of the arm as “my pet rock.”

Other patients bequeath their physical infirmities to phantom children. For instance, a woman blinded by a brain tumor became convinced that it was her child who was sick and blind, although the woman had no children.

These strange transformations and extensions of personal identity are beginning to yield insights into how the brain contributes to a sense of self, says neuroscientist Todd E. Feinberg of Beth Israel Medical Center in New York City. Thanks to technology that literally gets inside people’s heads, researchers now are probing how the brain contributes to a sense of self and to perceptions of one’s body and its control. Scientists expect that their efforts to shed light on the vexing nature of consciousness, as well as on the roots of mental disorders, such as schizophrenia, characterized by disturbed self-perception.

**I SPY** Scholars have argued for more than 300 years about whether a unified sense of self exists at all. A century ago, Sigmund Freud developed his concept of ego, a mental mechanism for distinguishing one’s body and thoughts from those of other people. Around the same time, psychologist William James disagreed, writing that each

person’s “passing states of consciousness” create a false sense that an “I” or an ego runs the mental show.

Researchers still debate whether the self is the internal engine of willful behavior or simply a useful fiction that makes a person feel responsible for his or her actions. Some investigators argue that each person harbors many selves capable of emerging in different situations and contexts.

Regardless of philosophical differences, Feinberg notes, evidence suggests that the brain’s right hemisphere often orchestrates basic knowledge about one’s self, just as the left hemisphere usually assumes primary responsibility for language.

Disorders of the self caused by brain damage fall into two main categories, Feinberg proposes. Some patients lose their personal

connection to significant individuals or entities, such as the man who thought everyone he knew was a familiar stranger and the woman who regarded her lifeless arm as a pet rock. Other patients perceive personal connections where they don’t exist, such as the man who saw his medical caretakers as family and coworkers and the woman who mentally conceived a phantom daughter.

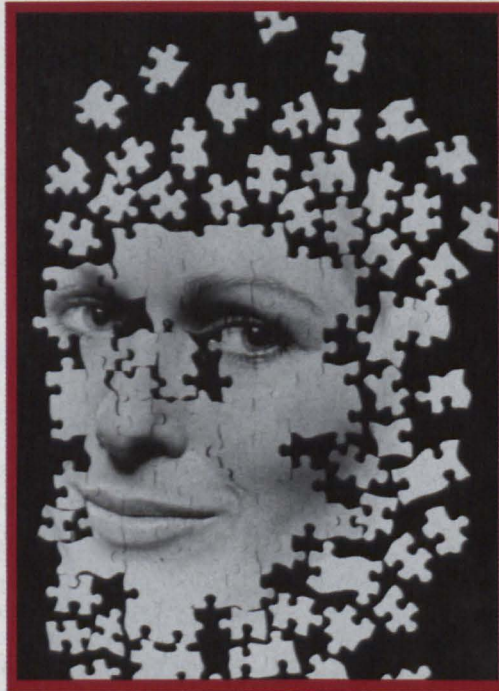
In both categories, Feinberg says, “right brain damage is much more likely than left brain damage to cause lasting disturbances of the normal relationship between individuals and their environments.”

Other neuroscientists take a similar view. According to brain-imaging studies conducted by researchers including Jean Decety and Jessica A. Sommerville, both of the University of Washington in Seattle, during the past 3 years, a right brain network located mainly in the frontal lobe organizes neural efforts aimed at discerning one’s body and thoughts. That network overlaps a brain circuit that plays a role in identifying others, perhaps contributing

to the two-sided nature of the self as “special and social, unique and shared,” Decety and Sommerville said in a seminal 2003 article.

**THE RIGHT ME** In order to coordinate the relationship between the self and the world, the brain takes sides, according to work by Feinberg and Julian Paul Keenan of Montclair State University in New Jersey. They analyzed patterns of brain damage in 29 previously published cases of disordered selves. Injury to the frontal region of the right hemisphere occurred in 28 people, compared with left-frontal damage in 14.

Ten of the patients had also incurred injuries to other parts of the right brain, compared with three individuals who displayed damage in other left brain areas, Feinberg and Keenan report in the December 2005 *Consciousness and Cognition*.





Research in the past decade on the recognition of one's face reached similar conclusions. In a study directed by Keenan, adults with no known brain impairment viewed images that gradually transformed from their own faces into the face of a famous person such as Marilyn Monroe or Bill Clinton. Participants alternated using their left or right hands to hit keys that indicated whether they saw themselves or a famous person in each composite image.

When responding with their left hands, volunteers identified themselves in composite images more often than when they used their right hands. Since each side of the brain controls movement on the opposite side of the body, the left-handed results implicated the right brain in self-recognition.

Similar findings came from epileptic patients who underwent a medical procedure in which one brain hemisphere at a time was anesthetized. Keenan and his colleagues showed each patient an image that blended features of his or her own face with facial features of a famous person and later asked whose face the patient had seen. When tested with only the right brain awake, most patients reported that they had seen their own faces. When only the left brain was active, they usually recalled having seen the famous face.

A brain-scan investigation of 10 healthy adults, published in the April 15, 2005 *NeuroImage*, also implicates the right hemisphere in self-recognition. A team led by Lucina Uddin of the University of California, Los Angeles showed volunteers a series of images that, to varying degrees, blended their own faces with those of same-sex coworkers. Participants pressed keys indicating whether they saw themselves or a coworker in each image.

Pronounced blood flow, a sign of heightened neural activity, appeared in certain parts of the right hemisphere only when the participants recognized themselves, Uddin's group reports. Previous studies in monkeys indicated that these areas of the brain contain so-called mirror neurons, which respond similarly when an animal executes an action or observes another animal perform the same action (*SN: 12/10/05, p. 373*).

A right brain network of these mirror neurons maintains an internal self-image for comparison with faces that one sees, Uddin and her colleagues propose.

Still, not everyone regards the right brain as central to the self. Todd F. Heatherton of Dartmouth College in Hanover, N.H., and his coworkers reported in 2003 on a patient who had had surgery to disconnect the bundle of nerve fibers that connects the neural hemispheres. That split-brain patient recognized himself in images that blended his features with those of one of the researchers only when the images appeared in his right visual field and were thus handled by his left brain.

"Recognition of the self is one of the most basic, yet poorly understood, cognitive operations," Uddin says.

**LOSING CONTROL** Chris Frith, a neuroscientist at University College London, has long wondered why people diagnosed with schizophrenia often experience their own actions as being controlled by others. A person with this severe mental disorder may report, for example, that space aliens ordered him to behave destructively.

Fifteen years ago, Frith thought that schizophrenia robbed people of the ability to monitor their intentions to act. If their behavior came as a complete surprise, they might attribute it to external forces.

Frith abandoned that idea after reading neurologists' reports of a strange condition called anarchic-hand syndrome. Damage to motor areas on one side of the brain leaves these patients unable to control the actions of the hand on the opposite side of the body. For example, when one patient tried to soap a washcloth with his right hand, his left hand, much to his chagrin, kept putting the soap back in its dish. Another patient used one hand to remove the other from doorknobs, which it repeatedly grabbed as he walked by doors.

Despite being unaware of any intention to use a hand in these ways, anarchic-hand patients don't experience their behavior as controlled by space aliens or another outside entity—they just try to correct their wayward hands.

Frith now suspects that anarchic-hand syndrome and schizophrenia's delusions of being controlled by others share a neural defect that makes it seem like one's movements occur passively. However, people with schizophrenia mistakenly perceive the passive movements as having been intentional.

In support of this possibility, Frith and his colleagues find that when shown scenes of abstract shapes moving across a computer screen, patients with schizophrenia, but not mentally healthy volunteers, attribute good and bad intentions to these shapes. Patients with schizophrenia may monitor their own actions in excruciating detail for signs of external control, Frith suggests.

**"Recognition of the self is one of the most basic, yet poorly understood, cognitive operations"**

— LUCINA UDDIN,  
UNIVERSITY OF  
CALIFORNIA,  
LOS ANGELES

In general, people rarely think about their selves but act as if such entities must exist. "The normal mark of the self in action is that we have very little experience of it," Frith says.

Harvard University psychologist Daniel Wegner goes further. Expanding the view of William James, Wegner argues that the average person's sense of having a self that consciously controls his or her actions is an illusion. This controversial proposal builds on an experiment conducted more than 20 years ago by neurophysiologist Benjamin Libet of the University of California, San Francisco.

Libet found that although volunteers' conscious decisions to perform a simple action preceded the action itself, they occurred just after a distinctive burst of electrical activity in the brain signaled the person's readiness to move. In other words, people decided to act only after their brains had unconsciously prepared them to do so.

Wegner has since performed experiments demonstrating the ease with which people claim personal responsibility for actions that they have not performed. In one study, participants looked in a mirror at the movements of an experimenter's arms situated where their own arms would be. When the arms moved according to another researcher's instructions, volunteers reported that they had willed the movements.

Feinberg says that these findings offer no reason to write off the self as a mental mirage.

**WAIST NOT** A young woman stands in neuroscientist J. Henrik Ehrsson's laboratory at London's University College and places her palms on her waist. Cuffs placed over her wrists begin to vibrate tendons just under the skin, creating the sensation that her hands are bending inward. At the same time, the woman feels her waist and hips shrink by several inches to accommodate the imagined hand movements. Dr. Ehrsson's illusory instant-waist-loss program lasts only about 30 seconds.

Ehrsson and his coworkers used a brain-imaging machine to measure blood flow in the brains of 24 people as they experienced this illusion. Parts of the left parietal cortex, located near the brain's midpoint, displayed especially intense activity as volunteers felt their waists contract, the scientists report in the December 2005 *PLoS Biology*.

The greater the parietal response, the more waist shrinkage the individual reported.

The scientists suspect that the activated parietal areas integrate sensory information from different body parts, a key step in constructing an internal image of one's body size and shape. When the brain receives a message that the hands are bending into the waist, it adjusts the internal body image accordingly, Ehrsson's team hypothesizes.

The brain can adjust its internal body map in a matter of minutes, the experiment demonstrates. Researchers who similarly



induced illusions of expanding fingers came to that same conclusion (SN: 7/30/05, p. 69).

The possibility that the brain can redraw body image in dramatic ways resonates with neuroscientist Miguel A.L. Nicolelis of Duke University Medical Center in Durham, N.C., and his colleagues. They've found that after monkeys learn to alter their brain activity to control a robotic arm, the animals' brains show the same activity pattern as when they move their own limbs.

Nicolelis' team reported in 2003 that the researchers had implanted electrodes in the frontal and parietal lobes of the brains of two female rhesus monkeys that used a joystick to control a cursor on a computer screen. That action maneuvered a robotic arm in another room. The animals gradually learned to modulate their brain signals to reposition the cursor, without moving a muscle.

Electrode data show that, after training, many neurons that formerly emitted synchronized signals as the monkeys manually manipulated the joystick to control the robotic arm also did so when the animals performed the same task mentally. Those results appeared in the May 11, 2005 *Journal of Neuroscience*.

The monkeys assimilated into their neural self-images a tool that they had learned to use proficiently, Nicolelis suggests. Apes and people possess an even stronger capacity for integrating tools into the brain's definition of self, in his view. This process may underlie the acquisition of expertise (SN: 4/12/03, p. 234).

"Our brains' representations of our bodies are adaptable enough to incorporate any tools that we create to interact with the environment, from a robot appendage to a computer keyboard or a tennis racket," Nicolelis says.

**SELF DOUBTS** Despite the proliferation of such studies, the self's special status in the brain is far from assured. After reviewing relevant brain imaging and psychology studies, neuroscientists Seth J. Gillihan and Martha J. Farah, both of the University of Pennsylvania in Philadelphia, found little compelling evidence

for brain networks devoted solely to physical or psychological aspects of the self.

At most, work such as Feinberg's with brain-damaged patients indicates that singular brain networks distinguish between one's limbs and those of other people, the researchers say. There are also suggestions that other brain areas foster a sense of control over one's limb movements, Gillihan and Farah reported in the January 2005 *Psychological Bulletin*.

Still, much of what we typically think of as "the self" may not be assignable to brain states or structures, in their view.

Feinberg argues that each of the increasingly complex levels of the brain—including the brain stem, the limbic system, and the cortex—contributes to intentional actions and to perceiving meaning in the world, the main ingredients of an "inner I."

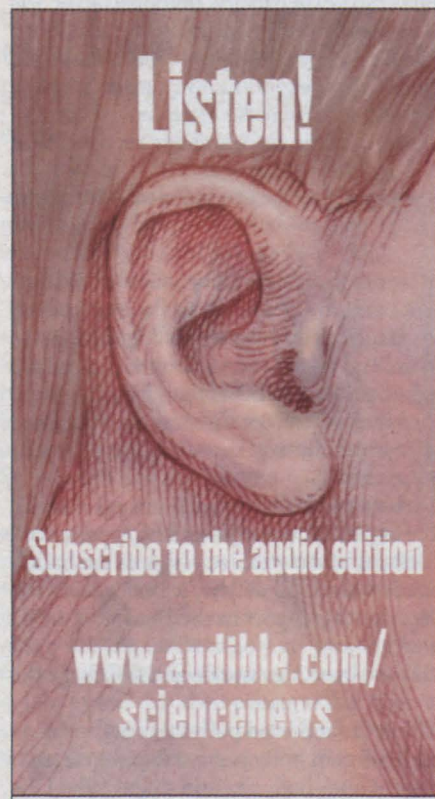
Brain-damaged patients vividly illustrate the self's resiliency, Feinberg adds. While injury to the right frontal brain transforms some patients' identities in odd ways, other comparably injured patients somehow maintain their old selves.

A person's coping style and emotional resources usually influence responses to right brain damage, according to Feinberg's clinical observations. For example, one patient, a young man living half a world away from his family, referred to his paralyzed left arm as his brother's arm.

Feinberg asked the man what it meant to him to possess his sibling's arm rather than his own. "It makes me feel good," the man responded, in a voice choked with emotion. "Having my brother's arm makes me feel closer to my family." ■

"Our brains' representations of our bodies are adaptable enough to incorporate tools."

— MIGUEL A.L. NICOLELIS,  
DUKE UNIVERSITY  
MEDICAL CENTER



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## ZOOLOGY

### Hawk skin sends UV signal

The patch of skin above a hawk's beak just looks orange-yellow to us, but to another hawk, it may broadcast ultraviolet (UV) sex appeal.

For the first time, researchers have shown that this bit of skin, called a cere, strongly reflects light in the UV range. The UV reflection isn't as bright as the orangey light coming from the patch, but it's distinct, report François Mougeot and Beatriz Arroyo of the Center for Ecology and Hydrology in Banbury, Scotland.

Many researchers have focused on

orangey carotenoid pigments in both the plumage and the fleshy decorations of birds as possible signals of mate quality and sexiness. But studies have also shown that some of these features, such as grouse combs, flash UV.

Mougeot and Arroyo tested cere reflectance in wild male Montagu's harriers in France. The ceres do reflect UV, especially in males from pairs that start nests early in the season, the researchers report in an upcoming *Biology Letters*. Other researchers have linked early nesting to greater breeding success. Thus, suggest the researchers, a bright UV cere may signal a prime male harrier. Mougeot and Arroyo haven't tested harriers for UV vision, although many bird species can see light in that range. —S.M.

## BIOMEDICINE

### Newborn head size linked to cancer risk

Healthy babies born with larger-than-average heads may face an increased risk of childhood brain cancer, a study suggests.

Head circumference reflects brain size, so a large head circumference may indicate

abnormal growth in the brain. Norwegian researchers analyzed 1.1 million records of births between 1978 and 1998, excluding babies born with very small or very large heads that would indicate other medical problems. The scientists also ruled out babies born extremely premature, overdue, underweight, or overweight.

By matching the head-size data with information from the Norwegian cancer registry, the researchers assessed how many babies born with a given head size went on to develop brain cancer.

The overall risk of brain cancer was small, says study coauthor Sven Ove Samuelsen of the Norwegian Institute of

Public Health in Oslo. Only 453 children in the study developed the disease.

But babies born with a head circumference of 39 centimeters or more were four times as likely to develop brain cancer as were babies born with average-size, 35-cm heads, the researchers report in the January *Lancet Oncology*.

Babies born with 38-cm heads had a risk of brain cancer nearly double that of the average group.

The findings suggest that brain cancer, or conditions conducive to it, originate in the womb, the scientists note. The cancer could arise from immature, cancer-prone cells under the influence of growth-promoting proteins in the brain, the researchers speculate, or from exposure to radiation or infections. In any case, the risk appears to be site-specific: Head size wasn't associated with development of leukemia or other cancers. —N.S.

## BEHAVIOR

### Depression's rebirth in pregnant women

Although sometimes touted as natural mood enhancers, hormonal changes during pregnancy offer no biological protection against major depression for expectant mothers who temporarily stop taking their antidepressant drugs, a new study finds.

Among 82 women who continued to use previously prescribed antidepressants

throughout their pregnancies, 21, or 26 percent, experienced a recurrence of depression, says a team led by psychiatrist Lee S. Cohen of Massachusetts General Hospital in Boston. In contrast, 44 of 65 women, or 68 percent, who discontinued antidepressant medications sank back into depression during their pregnancies, the researchers report in the Feb. 1 *Journal of the American Medical Association*.

Cohen's group studied pregnant women who had experienced depression before pregnancy and were receiving treatment at medical centers in Atlanta, Boston, or Los Angeles. Each woman completed monthly psychiatric interviews beginning no later than 16 weeks after conception.

Earlier research supports women's concerns about the toxic effects of prenatal exposure to antidepressants. The new findings illustrate that untreated depression during pregnancy may also present dangers, the researchers suggest. —B.B.

## ENVIRONMENT

### Prions' dirty little secret

Fifteen years ago, scientists at the National Institutes of Health reported that malformed prions—proteins that can trigger lethal illnesses including mad cow disease—remain on soil surfaces for at least 3 years. Now, scientists report why rain doesn't flush away the prions: The proteins bind almost irreversibly to clay.

In fact, clay can "retain up to its own mass of ... prion proteins," says Peggy Rigou of the National Institute of Agronomic Research (INRA) in Jouy-en-Josas, France.

Her team added sheep prions to pure clay, sandy soil, and loam. Positively charged parts of the protein molecules bound to the negatively charged surface of the clay that was present in all the soil samples. Extensive washing failed to dislodge the prions. However, when the chemists treated the mixtures to make the proteins negatively charged and then ran an electric current through each mixture, the prions migrated off the clay particles.

Freeing the prions was a major achievement, Rigou notes, because it enables scientists for the first time to measure prion concentrations in soil. Until now, no technique could confirm that intact prions were present in soil. In an upcoming *Environmental Science & Technology*, her team reports that the new procedure permits detection of concentrations as low as 0.2 part per billion.



**BETWEEN THE EYES** The bare skin just above the beak of this male Montagu's harrier reflects ultraviolet light.



Soils might acquire prions from animal wastes or carcasses. Scientists' concern is that livestock might ingest infected clay particles while eating grass or drinking from mud puddles, Rigou says. —J.R.

## BIOTECHNOLOGY

### Virus has the Midas touch

Researchers have recruited a stringlike virus to carry nanoscale loads of gold that could serve as imaging agents in cancer diagnosis.

The team at the M.D. Anderson Cancer Center in Houston used a virus called an M13 phage, which normally infects bacteria. In the past, scientists had genetically engineered the 1-micrometer-long virus to attach to various receptors on mammalian cells. In this experiment, Renata Pasqualini and Glauco R. Souza and their colleagues enlisted a virus that binds to a receptor found on tumor cells.

The group mixed multiple copies of the modified virus with gold particles roughly 45 nanometers in diameter. The components self-assembled into a network of overlapping strings and spheres held together by the attraction between the viruses' positively charged bodies and the negatively charged gold spheres, says Souza.

In the Jan. 31 *Proceedings of the National Academy of Sciences*, the researchers demonstrate in cancer cells growing in the lab that the gold-phage networks attach to the cells. The gold nanoparticles give the targeted cells a distinct signal in a detection system called surface-enhanced Raman scattering.

"You could envision using these bio-gold nanoparticles in order to seek out tumors and then conceivably send out a signal when they've arrived," says cancer biologist Bruce Zetter of Children's Hospital Boston. —A.C.

## NEUROSCIENCE

### Finding a face place in monkeys' brains

Monkeys recognize a wide variety of faces thanks to a brain area that specializes in face perception, according to a new study.

A team led by Doris Y. Tsao of Harvard Medical School in Boston used functional magnetic resonance imaging (fMRI) to identify three particularly face-responsive

patches of brain tissue in each of two macaque monkeys. The researchers then implanted electrodes in each monkey's most-active brain area to record responses from a total of 310 neurons.

All but eight of these cells, or 97 percent, responded far more strongly to the sight of faces than to images of patterned grids, fruits, gadgets, or people's or monkeys' bodies and hands, Tsao and her colleagues report in the Feb. 3 *Science*. All sorts of faces elicited notable neural reactions, including human and macaque faces, familiar and unfamiliar faces, and cartoon faces.

The only other images that sparked activity, though weak, in these cells were clock faces and round fruits, which the researchers point out have the general shape of faces.

Intriguingly, brain tissue specialized for face perception was located in one monkey's left hemisphere and in the other's right hemisphere.

Earlier electrode studies conducted without fMRI guidance in monkeys indicated that no more than 30 percent of the cells in any brain area preferentially respond to faces.

The researchers plan to study the monkeys' other face-sensitive areas with electrodes. It's unclear whether any of these regions correspond to a brain area in people that has been implicated in face perception (*SN*: 7/7/01, p. 10). —B.B.

## BIOMEDICINE

### Mouth cancer data faked, journal says

A study claiming to find that anti-inflammatory drugs including ibuprofen reduce the risk of mouth cancer in smokers was based on falsified data, according to the medical journal that published the research.

Jon Sudbø of the Norwegian Radium Hospital and the University of Oslo presented the findings last year at a cancer-research meeting in Anaheim, Calif. (*SN*: 5/7/05, p. 302) and in the Oct. 15, 2005 *Lancet*. Through his lawyer, Sudbø has admitted that he made up the 908 patients cited in the paper. *Lancet* is seeking a retraction.

Other papers authored by Sudbø are also under scrutiny, and officials of the Norwegian Radium Hospital said that they are reviewing all of Sudbø's research.

A study in the April 26, 2001 *New England Journal of Medicine* (*NEJM*) showed photographs of two supposedly distinct types of abnormal mouth tissue. In a statement published online Jan. 20, *NEJM* says that these photos were the same and that the journal is awaiting the results of the review by Sudbø's institution. The state-

ment says that another *NEJM* Sudbø paper is also in doubt.

Moreover, in the March 20, 2005 *Journal of Clinical Oncology*, Sudbø falsely claimed to have obtained blood samples from volunteers, according to Sudbø's lawyer.

The revelation comes on the heels of another case of fraud in medical science. Recently, South Korean researcher Woo-Suk Hwang—who claimed to have cloned the first human embryonic stem cell lines—was found to have faked the data in two studies published in *Science* (*SN*: 12/24 & 31/05, p. 406; 1/14/06, p. 20). *Science* has retracted both papers. —N.S.

## GENETICS

### Chimps creep closer yet

Chimpanzees may be more closely related to humans than to any other primate, new genetic evidence suggests.

"We all know that humans and chimps are extremely close genetically," says study coauthor Soojin Yi, an evolutionary biologist at the Georgia Institute of Technology in Atlanta. The two species diverged from a common ancestor from 5 million to 7 million years ago and have 95 to 98 percent of their DNA in common, previous research has established.

But by measuring the accumulation of small differences in DNA between the two species, Yi and her colleagues found another shared trait: a slow "molecular clock," or rate of evolutionary change.

Of all primates, modern people live longest, have the longest gestation time, and reach sexual maturity latest, Yi says. More time between generations means slower rates of evolution at the level of DNA, or a slower molecular clock, she says.

But chimp clocks don't tick much faster, the new study shows. After analyzing millions of base pairs of DNA in people and other primates, including chimps, baboons, and gorillas, the researchers found that while the human clock is 3 percent slower than the chimp's, it is 11 percent slower than the gorilla's. Taking into account the small difference between human and chimp clocks, the team calculated that people's longer time between generations and large brains evolved only 1 million years ago. The findings appear in the Jan. 31 *Proceedings of the National Academy of Sciences*.

The new finding bolsters a controversial idea that people and chimps share a genus, Yi says.

The study is "exceptionally interesting," says molecular evolutionist Morris Goodman of Wayne State University in Detroit. "We humans have an exaggerated opinion of how great we are." —C.G.



# Books

A selection of new and notable books of scientific interest

## THE CREATING BRAIN: The Neuroscience of Genius

NANCY C. ANDREASEN

What do playwright Neil Simon, composer Wolfgang Amadeus Mozart, and mathematician Henri Poincaré have in common? Each man is or was considered a creative genius, but their similarities may also lie in their neuroanatomy, writes Andreason. An English-literature professor turned neuroscientist, she ponders the origins of creativity, the distinctions between it and high levels of intelligence or skill, and the physiological and psychological traits that research has suggested are common to creative people. For instance, she notes that creative people often report feeling as if they're invisible observers on the world. They seem to enter altered states of consciousness when engaged in the creative process. Probably because of such tendencies in these people, many scientists hypothesize a close relationship between mental illness and creativity. The author examines the role of nature and nurture in forming people who create works of art and come up with original ideas in the sciences. *Dana Press, 2005, 225 p., b&w photos, hardcover, \$23.95.*

## 25 BIG IDEAS: The Science That's Changing Our World

ROBERT MATTHEWS

The author's mission in this book is to remind readers that scientists don't know everything. "Contrary to what some might believe," scientist-journalist Matthews writes, "science shows no signs of reaching completion." The evidence of this, writes Matthews, lies in the continuing discovery of unexpected phenomena about the universe, from dark matter to quantum entanglement, and about ourselves, from brain parts that create human consciousness to the role genetics plays in forming a person. Each chapter is devoted to a different big idea and includes a succinct overview of its topic, from game theory to plate tectonics to the early human migration out of Africa. Matthews includes definitions of commonly used jargon and references for further reading. He also explains how arduous yet clever the scientific process behind each discovery or technological development has been. Matthews makes important and exciting ideas in science accessible. *OneWorld Pub., 2005, 186 p., b&w photos, paperback, \$14.95.*

## A MEASURE OF EVERYTHING: An Illustrated Guide to the Science of Measurement

CHRISTOPHER JOSEPH, ED.

Since the dawn of humanity, someone has been measuring something for some reason. From gathering enough food for the tribe to discerning precise distances between celestial bodies, the ability to

measure is part of the foundation of civilization, Joseph writes. He examines various units of measurement, starting with the cubit, the approximate length of a man's forearm, and culminating in the precise units of the metric system. The short entries in the book are organized into the fields of Earth and life sciences, including astronomy, meteorology, geology, and medicine; the physical sciences, including chemistry, electricity, and magnetism; and technology and leisure, including finance, music, and food. In each category, the author and his contributors include measurements both historic and current. They also offer some bar-bet material: what a dollar measures in the field of nuclear physics (no, not federal funding), what a Mickey measures on a computer, and just how much a pinch of salt really is. *Firefly, 2005, 224 p., color images, paperback, \$24.95.*

## RIGHT, WRONG, AND RISKY: A Dictionary of Today's American English Usage

MARK DAVIDSON

Is the correct phrase *en route* or *on route*? Is *everybody* plural or singular? Does the phrase "head over heels in love" even make sense? Through everyday discourse, American English has evolved, incorporating, for better or worse, new definitions for old words, invented terminology, and phrases that are simply incorrect. For writers and word lovers seeking literary accuracy and proper usage, Davidson, a former communications professor, provides answers to common word-usage controversies with wit, insight, and humorous anecdotes. Supported by evidence ranging from the dictates of leading dictionaries to the style guidelines of print-media giants such as the New York Times to the conventions of storefront signs, Davidson explains spelling, word choice, grammar, and punctuation. This helpful guide includes an alphabetical list of French terms used in standard English and musings on Valley girls' usage of the word *like*. *Norton, 2005, 544 p., hardcover, \$29.95.*

## THE BEDSIDE BOOK OF BIRDS: An Avian Miscellany

GRAEME GIBSON

Throughout history, birds have represented mythic beings, metaphors for human aspiration, omens, inspiration, and dinner. In this beautifully presented book, Gibson, an avid bird-watcher and novelist, collects a multitude of writings and imagery that celebrate the special relationship between birds and people. He includes passages from such writers such as T.S. Eliot, Henry Thoreau, Franz Kafka, and Charles Darwin. The passages range from early-19th-century descriptions of toucans in the Amazon, to Bible passages on ravens, to citations of birds as literary and scientific inspiration, to descriptions of certain species as harbingers of death. Woven into the book are gorgeous images and paintings of birds. The volume ends with a list of organizations that are protecting bird species in peril. *Doubleday, 2005, 370 p., color images, hardcover, \$29.95.*

# LETTERS

## Preventive measure?

Regarding "Rare but Fatal Outcome: Four deaths may trace to abortion pill" (*SN: 12/3/05, p. 358*), would it be possible for an antibiotic to be included with the RU-486 package to prevent a *Clostridium sordellii* infection? Like millions of other people, I have to take an antibiotic prior to dental procedures to prevent the very rare possibility of an infection in my heart, and it would seem the same kind of preventive measure could be used with RU-486 (mifepristone).

GILLIAN MELLO, SAN LEANDRO, CALIF.

*A Food and Drug Administration Web site states: "At this time FDA does not have sufficient information to recommend the use of preventive antibiotics for all women undergoing [RU-486] abortion. ... Preventive antibiotic use carries its own risk of serious adverse events such as severe or fatal allergic reactions [and] the growth of 'superbugs,' bacteria resistant to everyday antibiotics." Researcher Marc Fisher adds that "there is no evidence at this time that antibiotics would be effective in preventing potential C. sordellii infections following [RU-486] abortion." —N. SEPPA*

## Words unspoken

The lack of the linguistic device "recursion" in the Pirahã language might be more subtle than investigator Dan Everett suspects ("The Pirahã Challenge," *SN: 12/10/05, p. 376*). I've heard examples of the sentence given as recursion—"When I finish eating, I want to speak to you"—rendered as a run-on sentence by speakers new to English and by lifelong speakers as well: "I finish eating I speak to you." The "when," which determines the timing of the second part of the run-on, is implied. Perhaps something similar occurs in Pirahã.

WILLIAM BRITTON, NORTH PORT, FLA.

Pirahã seem to be using words and other noises as signs rather than symbols. Symbols routinely refer to absent abstractions, whereas signs merely direct attention to potential objects of experience. We shouldn't be surprised that a grammar of signs like those of the Pirahã might differ from a grammar of symbols.

RICHARD LIND, TULSA, OKLA.

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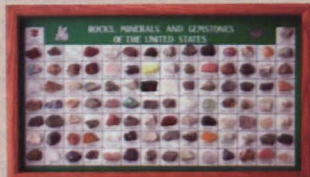




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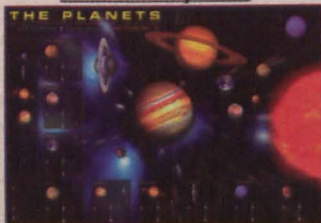
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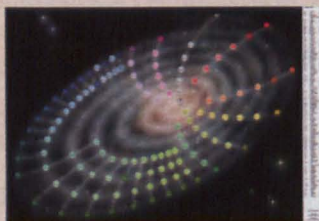
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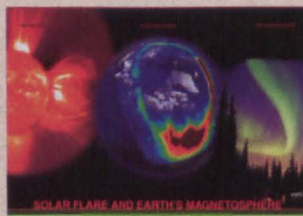
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