

SCIENCE NEWS

THE WEEKLY NEWSMAGAZINE OF SCIENCE

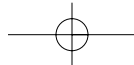
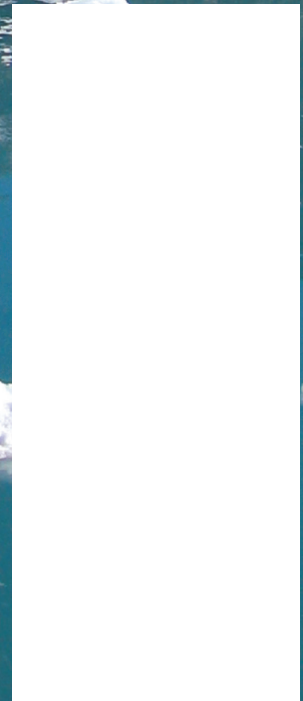
JULY 29, 2006 PAGES 65-80 VOL. 170, NO. 5

slogging for slime molds
new volcanic variation
concrete results
leukemia drug is heart harsh

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cold dip



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Cover An autonomous underwater vehicle that can gather data beneath free-floating ice was first sent beneath an Antarctic ice shelf early last year. There, a vehicle called Autosub (here pictured in Greenland) observed an unexpectedly jumbled topography on the underside of the ice. (A. Webb/National Oceanography Centre, Southampton) [Page 72](#)

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This Week

Breaking Crust

Sonar finds new kind of deep-sea volcano

Explorations east of Japan have revealed a previously unknown type of volcano.

Volcanoes typically emerge in one of three geological settings, explains Stephanie P. Ingle, a geochemist at the University of Hawaii in Honolulu. Some crop up along mid-ocean ridges, where Earth's tectonic plates spread apart. Others, such as those on land along the western coast of North America, form where one plate is being subducted, or forced beneath, another plate. And volcanoes far from plate boundaries, such as those in Hawaii, appear where hotter-than-normal plumes of Earth's mantle well up (*SN*: 7/9/05, p. 24).

Ingle and her colleagues, however, have found inactive volcanic features in a completely new setting under the sea about 600 kilometers from Japan. "Finding these peaks was serendipitous luck," Ingle notes.

Analyses of ocean floor nearer Japan had hinted at the presence of undersea volcanoes. So, Ingle's team used sonar to scan the ocean bottom farther offshore. In a 6-km-deep location in the Pacific, the team spotted peaks about 1 km across and 50 meters high. Lava samples were then dredged from the exposed portions of those mostly buried volcanoes.

The thickness of mineral layers that had formed on the surfaces of lava chunks suggests that the undersea volcanoes were last active 50,000 to 1 million years ago, the researchers report in an upcoming *Science*. The scientists also describe the peaks they had found nearer Japan. Those erupted between 8 million and 4 million years ago.

Chemical analyses of crystals embedded in the lava hint that the material originated about 14 km below the ocean floor. However, current models of Earth's structure hold that any of the minerals

expected at those depths should be solid, so they wouldn't provide lava to fuel volcanoes, says Ingle.

Unexpectedly high concentrations of water or other volatile substances in the rocks could lower their melting points, she notes. Then, the first substances to melt would yield lava containing high concentrations of sodium and potassium—just as the lava dredged from the newfound volcanoes does.

The researchers speculate that the unusual volcanoes formed where the ocean floor flexed and cracked as it headed toward the Japan subduction zone.

"This is a surprising place to find volcanism," says Donald W. Forsyth, a marine geophysicist at Brown University in Providence, R.I. However, he notes, it's not clear that the volcanic activity is related to flexure of the ocean floor. Most plate-tectonic models suggest that ocean-floor stresses in that region wouldn't be high enough to fracture Earth's crust.

The team's findings call for a re-examination of whether mantle plumes caused other volcanoes that are far from tectonic-plate boundaries, says Marcia K. McNutt, a geophysicist at the Monterey Bay Aquarium Research Institute in Moss Landing, Calif. The newfound undersea peaks are clear-cut examples of volcanoes that have been formed by an alternative method, and such a mechanism may be at work elsewhere as well, she notes. —S. PERKINS

QUOTE



This is a surprising place to find volcanism."

DONALD W. FORSYTH,
Brown University

Babbling Bats

Do pups talk baby talk as human infants do?

Young sac-winged bats jumble bits of adult-sounding calls into strings, say researchers who've recorded the babies' vocalizations.

The pups make these jumbled noises without the usual contexts, and that's babbling, contends Oliver Behr of the University of Erlangen-Nuernberg in Germany. The nonsense amounts to bat versions of the jabberings of human babies and young birds, he and his colleagues argue in an upcoming *Naturwissenschaften*. "It's the first example of babbling in mammals other than primates," says Behr.

The new bat study focuses on Costa Rican colonies of *Saccopteryx bilineata*. A sac-winged male defends a roost that includes several females. The name *sac-winged* comes from little pouches in which males carry a slurry of genital secretions and urine. They wave these pouches at females in courtship displays (*SN*: 1/1/00, p. 7).



GOO GOO A sac-winged bat pup makes a considerable variety of noises, but researchers suspect that it's all nonsense.

One of the study's coauthors, Mirjam Knörnschild, also of Erlangen-Nuernberg, says she wasn't thinking about babbling when she started recording bat-pup sounds. She expected to find what biologists call infant-mother contact calls, animal versions of "Mommy! Mommy!"

Sac-winged bats vocalize during courtship or territorial spats. Babies also make sounds when they're separated from their mothers. Some social calls include barks, chatters, and screeches low enough for people to hear, while other social sounds and navigational squeaks are above the range of human ears.

Bat scientists depend on recording devices that pick up calls across a wide range of frequencies.

Knörnschild recorded contact calls from bat pups but also found a variety of sounds resembling adult calls. "For a while, I doubted my ability to sex and age baby bats correctly because I kept getting recordings of female pups sounding like adult males," she says. Finally, she thought of comparing those sounds with those of human babies repeating adult syllables willy-nilly.

She observed, for example, that young female pups at times give the trill of courting males. Adult females typically don't make that sound. The trills, Behr says, remind him of horse whinnies.

Bat pups also make the call that adults give during territorial disputes.

Furthermore, young bats interspersed elements of adult territorial and courtship songs amid echolocation squeaks.

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This Week

Another researcher who's made recordings of the same species of bats isn't ready to call this babbling. Gerald Wilkinson of the University of Maryland at College Park says that he's not persuaded that adult bats confine their calls to single contexts.

Michael Goldstein of Cornell University studies the imperfect sounds of human baby talk and the mispronounced tootlings of young songbirds. "If I walked down the hall saying 'hamster, hamster' repeatedly [with the] correct acoustics but not in the correct context ... it might be acting weird, but it's not babbling, per se," he says.

However, he adds, "I think it's OK for the definition to change for different species."

Charles Snowdon of the University of Wisconsin-Madison adds a social dimension to the description of babbling. The infant marmosets that he has studied produce repetitive, jumbled sounds that, like human baby talk, prompt adults to respond. He says that he'd like to know whether bat pups' vocalizations elicit a response. —S. MILIUS

Hairy Calculations

Picturing tresses in a truer light

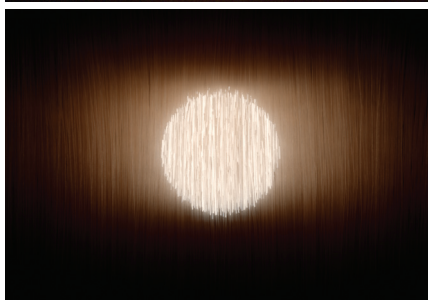
Computer animators find hair tricky to portray realistically because it contains so many strands and because these strands respond in complex ways to light, wind, head motion, and each other. For blond hair in particular, some of the hair's most important optical properties have been missing from software simulations that render cartoon tresses. So, animators have had to play hairdresser, tediously adding a sunny, diffuse glow to unrealistically dull coiffures.

Now, computer scientists have devised a way to trace light rays through a realistic computer model of light-colored hair. The method enables computers to automatically generate a golden color and sheen.

"The nice thing is that now we can use realistic parameters for the hair. We don't have to fake it anymore," says Stephen R. Marschner, who developed the new approach with Jonathan T. Moon. Both are at Cornell University.

Moon is scheduled to present the work Aug. 3 in Boston at the SIGGRAPH 2006 computer-graphics conference.

Real hair reflects some light and lets some pass through. In 2003, a research team that included Marschner depicted hairs in a simulation with sufficient realism to include the transmission of light through the shaft. Before that work, rendering programs treated hairs as opaque plastic cylinders, "like a bunch of little colored wires," Marschner says.



BLOND ON BLOND Actual blond hair (top circle) diffuses light coming from behind, and so does hair in a novel computer simulation (lower circle). Blond hair rendered without the new calculations of light scattering looks gray (bottom, left), but such hair appears more natural (bottom, right) when rendered with them.

Although adding transparency improved the naturalness of computer-generated black and dark-brown hair, blond hair still looked lifeless. In the 2003 model, light that had passed through a hair didn't illuminate other hairs.

In reality, light-colored hair lets most of the light pass through. Moreover, the light refracts as it leaves each hair shaft, much of it spreading outward and perpendicular to

the shaft. So, the light that hits one patch of blonde hair also provides a soft glow to a wider area of a hairdo.

Unlike the 2003 algorithm, the new one includes illumination caused by transmitted and refracted light, Marschner notes.

The resulting improvement in light hair's look shows that "you really do have to care about this light that goes through the hair and bounces off other fibers many times," Marschner says. The technique also applies to fur, grass, and other fibrous materials, he adds.

The calculation time for rendering multiple scattering is a couple of hours per movie frame, which might be acceptable for films (*SN*: 1/26/02, p. 56) but is much too slow for computer games, says Marschner.

Animators used aspects of the 2003 advance to render the hair of computer-animated doubles for Naomi Watts in last year's film *King Kong*. Studios will probably take advantage of some features of the new computer improvement too, Marschner suggests.

Software engineer Ivan Neulander of Rhythm & Hues Studios, a Los Angeles-based animation company, says that the new approach is probably too slow for entertainment-industry artists to use routinely. On the other hand, he suggests, it "could serve as a benchmark against which simpler, fake models can be measured." —P. WEISS

Solid Information

Chemical composition can determine concrete's durability

A new analysis reveals how damage progresses in concrete that's exposed to sulfate, a nearly ubiquitous compound. The work could lead to the design of concrete structures with improved durability, the report's author says.

Concrete is made with Portland cement, a powdery mixture of crushed limestone and clay or shale. When the cement is mixed with water and added to gravel and sand, the resulting slurry hardens into concrete.

Portland cement consists primarily of four minerals: tricalcium silicate, dicalcium silicate, tricalcium aluminate, and tetracalcium aluminoferrite. The chemical reactions among these compounds and water form a glue that binds the gravel and sand.

Paulo J.M. Monteiro, a civil engineer at the University of California, Berkeley, has been studying mechanisms behind concrete damage caused by exposure to sulfate. Sulfate ions, which are common in water and soil either naturally or from inputs such as

MARSCHNER LAB

fertilizer, can penetrate concrete, causing it to crack and expand.

"Many people call this the 'cancer of concrete,'" Monteiro says.

He analyzed U.S. Bureau of Reclamation measurements of various concrete cylinders submerged in sodium sulfate solutions. The data, collected over 40 years, charted the progression of damage. Monteiro developed a model to determine how the chemical composition of each cylinder's cement and the amount of water used to make the cylinder influenced the formation of cracks during sulfate exposure.

Concrete with a high water-to-cement ratio eventually forms a network of cracks. Monteiro found that once that network appears, the rate of damage is influenced only by the chemical composition of the cement—not by the water-to-cement ratio. For instance, those concrete cylinders with the most tricalcium aluminate in their cement incurred structural damage sooner than other samples did.

Monteiro developed an index of "potential for damage" during sulfate exposure of concrete that had been made with a high water-to-cement ratio.

Concrete with a low water-to-cement ratio doesn't develop a network of cracks in response to sulfate solutions. Monteiro reports that when initial cracks occur, the exposed cement reacts with water around it, creating chemical products that "heal" the cracks. He describes his work in the Aug. 1 *Proceedings of the National Academy of Sciences*.

Monteiro "brings an extraordinary new insight" on how sulfate damage affects concrete, comments Hamlin M. Jennings, a materials scientist at Northwestern University in Evanston, Ill. "To have a fresh look at a complex problem like this can help push the field forward" and improve concrete durability, he says.

Jacques Marchand, a civil engineer at Laval University in Quebec City, Quebec, says that the work "is certainly a contribution that will help people understand how all these parameters interact with one another." —A. CUNNINGHAM

Side Effect Revealed

Heart risk found in leukemia drug

Since its introduction a few years ago, the cancer drug imatinib has given patients with chronic myelogenous leukemia an unprecedented chance at long-term survival. But studies of the drug in people and mice reveal an unexpected risk of heart failure lurking beneath imatinib's benefits.

A research team led by Thomas Force of Jefferson Medical College in Philadelphia evaluated 10 patients who suffered moderate-to-severe heart failure while taking imatinib, which is marketed as Gleevec by the drug company Novartis. In all 10 patients, none of whom had had previous heart problems, their heart's blood-pumping efficiency decreased after 1 to 14 months on the drug. When the researchers examined heart tissue from two of the patients, they found cell abnormalities characteristic of heart damage.

In a second study, Force's team gave imatinib to healthy mice. After 3 weeks, those mice showed a deterioration in heart contractions, the researchers report in the August *Nature Medicine*. The mice received drug doses similar—adjusted for size—to those prescribed for people.

"I don't think anyone would have expected this drug to have any cardiotoxicity," says Force.

About 90 percent of chronic myelogenous leukemia patients treated with imatinib survive for 5 years or longer. Before the drug was approved in 2001, average survival was less than 5 years.

Imatinib also treats a rare stomach cancer called gastrointestinal stromal tumor.

The drug stops the leukemia by inhibiting a cancer-causing two-protein combi-

nation called Bcr-Abl. The new study pinpoints Abl inhibition as the factor that leads to the heart failure. Although the protein's role remains unclear, Abl may be essential in maintaining cardiac health, says Force.

Only 1 to 5 percent of patients taking imatinib will develop heart failure, Force estimates, but he adds that long-term data are needed to establish a more precise figure.

One reason that earlier studies of imatinib didn't reveal the cardiac risk might be that instead of attributing heart problems to the drug, physicians assigned them to hypertension, diabetes, or other ailments common in the

leukemia patients, Force says.

Heart problems may not have shown up in early mouse studies because rodents metabolize imatinib quickly, he says.

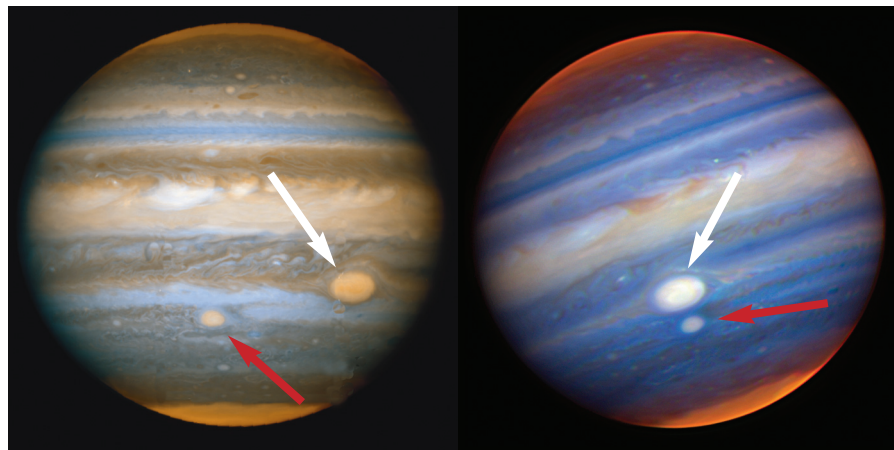
Despite imatinib's success against chronic myelogenous leukemia, recent studies have found that the drug loses its effectiveness in about one-fifth of patients (*SN: 6/17/06, p. 371*). Those patients are often given newer drugs that also inhibit Abl—and therefore could also cause heart problems, says leukemia specialist Michael Deininger of the Oregon Health and Science University in Portland.

But while the finding should prompt physicians to monitor patients taking imatinib for heart problems, it "isn't going to

STATS

100,000

Number of people taking the cancer drug Gleevec



Jovian storms of surpassing beauty

In April, a visible-light image (left) taken by the Hubble Space Telescope showed that a new giant storm (red arrows) in Jupiter's southern hemisphere was about 62,000 kilometers away from the planet's centuries-old Great Red Spot storm (white arrows). A near-infrared image (right) taken July 13 at the Gemini North Observatory atop Hawaii's Mauna Kea reveals that the oval storms are now separated by only 3,000 km, as the smaller, faster-moving spot brushes past the larger one. The Great Red Spot is more than twice the width of Earth, while the smaller Jovian hurricane, nicknamed Red Junior, has about the same width as Earth. The smaller spot formed a few years ago, when three storms merged. Moving in opposite directions, the two spots are expected to pass countless times as they travel around Jupiter's sphere. Although the spots appear white in the infrared image, they're tinged red in visible light. —R. COWEN

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This Week

stop people from taking Gleevec, because otherwise [the leukemia] is going to kill them," Deininger says. —E. JAFFE

Old Mice and Men

Species share genetic markers of aging

The amounts of protein produced by a particular set of genes could give researchers clues to how much a person or another animal has aged, scientists report. They say that the finding could be invaluable for developing new treatments to slow the toll that time takes on the body.

Researchers have long searched for molecular markers that track the rate of physical deterioration that accumulates with age. That pace varies widely among species and, to a lesser extent, among individuals within the same species.

"We all know people who look older or

younger than their age," says developmental biologist Jacob Zahn of Stanford University.

However, efforts to find biological indicators of aging have typically focused on individual tissues or single species. Such work has led to a mishmash of markers that have little in common, notes Zahn.

He and his colleagues asked whether any genetic markers could indicate the extent of aging in different tissues and among different organisms. Led by Stanford developmental biologist Stuart Kim, the researchers collected samples of muscle tissue from 81 surgery patients ranging in age from 20 to 80. The scientists analyzed each sample to determine how much protein each gene produced.

Their efforts led to a collection of 250 genes that changed expression level—making either more or less protein—as people became older.

Zahn and his colleagues then compared the expression levels of these genes with levels in similar datasets of human kidney and brain tissue. They also pored over catalogs of gene expression for aging mice and fruit flies.

Their investigation turned up 95 genes that tended to change expression with age in each of the three human tissues and both of the other organisms. All members

of this gene group regulate the electron-transport chain, a series of biochemical reactions that generates energy in cells.

The genes' expression levels were a better indication of tissue condition than a person's chronological age, Zahn and his colleagues point out. When the team examined muscle fibers for signs of aging, muscles that looked older or younger than average for the person's chronological age had corresponding changes in gene-expression levels. The team reports its findings in the July *PLoS Genetics*.

"It's a very nice paper," says Cynthia Kenyon, a University of California, San Francisco researcher who studies aging. She adds that the findings could lead to new ways to test antiaging drugs.

Researchers may someday look at a potential drug's effects on gene expression to determine whether it can change the aging rate.

Although the new report indicates which genes commonly vary their expression during aging, researchers still have few clues as to what elicits the expression change, says Sylvia Lee of Cornell University, who studies aging. "Finding the triggering events will probably have the most important implications in the long run," she says. —C. BROWNLEE

QUOTE



We all know people who look older or younger than their age."

JACOB ZAHN,
Stanford University

Freeing Up the Flow

Clearing neck-artery blockage diminishes signs of depression in elderly

Unclogging and propping open the large artery that supplies blood to the head can ease symptoms of depression in elderly people. That finding adds fuel to the debate over the hypothesis that impaired blood flow to the brain can cause depression.

Wolfgang Mlekusch of Vienna General Hospital in Austria and his colleagues identified 143 patients, average age 70, who were scheduled to undergo a procedure to open a blocked portion of the carotid artery. All patients had at least an 80 percent blockage in one of the branches of this artery, which carries freshly oxygenated blood from the heart.

In the medical procedure, performed under local anesthesia, a doctor inserted a bal-

loon-tipped catheter into an artery near the patient's groin or in an arm and threaded it up to the neck. Then, the doctor inflated the balloon to push aside the blockage and installed a mesh cylinder called a stent, which propped open the carotid artery.

Before the operation, the patients filled out a standard questionnaire that measures signs of depression. The researchers calculated a score that gauged each patient's depressive signs. At that time, the scores of 34 percent of the patients indicated significant depressive symptoms. The patients filled out the same questionnaire 4 weeks after the operation. Only 10 percent showed significant depressive symptoms then.

When the team compared pre- and postoperative scores, the average score fell by more than half. The researchers retested one-fourth of the patients 3 months later and found that the scores remained low, the team reports in the August *Radiology*.

For comparison, doctors gave the depression questionnaire to 102 people, average age 66, who were scheduled to have vascular surgery on their legs. The scores of 17 percent of these patients indicated depressive symptoms shortly before their operations. That percentage remained about the same 4 weeks after surgery.

The findings lend support to the vascular-depression hypothesis, says psychiatrist David C. Steffens of Duke Uni-

versity Medical Center in Durham, N.C. If poor blood flow indeed does disrupt brain circuits that maintain normal moods, restoring the flow in those areas may rekindle "the normal drive and motivation to do things," he says.

Stanton P. Newman, a psychologist at University College London, suggests that the before-and-after depression scores could have another explanation. Rather than prove that a carotid stent alleviates depression, he says, the study "more likely reflects the patients' anxiety and depression as measured just before a high-risk operation"—and their sense of relief afterward. The patients who underwent leg surgery wouldn't have felt as much anxiety, he contends. —N. SEPPA



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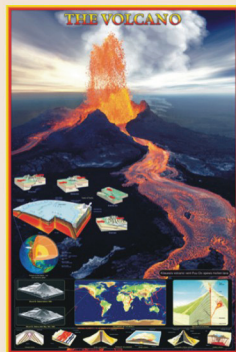
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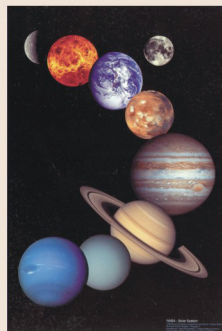
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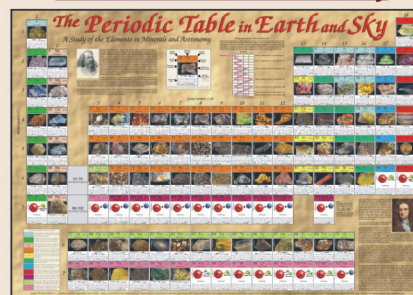
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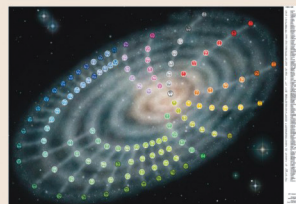
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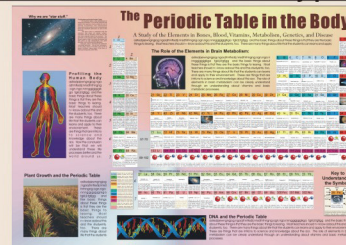
Chemical Galaxy - poster is a new creation in the world of periodic table charts. Developed by Philip Stewart, Oxford University, this table was created in a spiral design. It uses a starry pathway to link the elements and to express the astronomical reach of chemistry. Copyright 2006, Size: 26"H X 38"W Laminated, info sheet provided. Order#JPT-2221, Cost \$28.95

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The Periodic Table in the Body poster



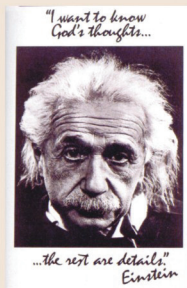
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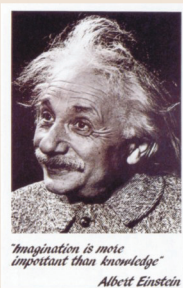
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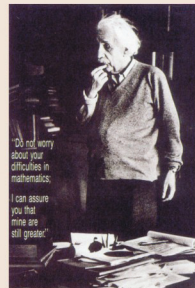
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INTREPID EXPLORER

An oceangoing rover gathers unprecedented data

BY SID PERKINS

The autonomous underwater vehicle, stuffed to its gills with scientific instruments, motors steadily through the frigid, sunless sea. Sensors on board the 6.8-meter-long craft are constantly on alert, testing the water for minute variations in salinity and temperature. As the vehicle cruises beneath a ceiling of ice hundreds of meters thick, its sonar observes above it a rugged topography of ice unlike any previously seen.

Although scientists had previously deployed autonomous underwater vehicles (AUVs) beneath free-floating ice, until last year they'd never sent an AUV under one of Antarctica's ice shelves. On that 50-kilometer maiden voyage, the craft got a tantalizing look at one of the world's most unexplored environments—one where seas increasingly warmed by modern climate change come into contact with ancient ice flowing off the continent.

Understanding what's taking place under ice shelves is vital for predicting how those features will evolve in a warming world—for example, how fast they'll shrink or break apart, and how much fresh water they'll provide to the oceans as they melt. Scientists have developed computer models that simulate these processes, but those models are coarse.

The fine-scale data that AUVs can gather could enable researchers to create more-detailed computer models as well as to verify or fine-tune the results from existing ones, researchers say. Cameras taken along for the ride could give biologists their first look at what life is like in such an alien environment.

ON THE SHELF Ice-covered Antarctica, the world's third-largest continent, covers about 14 million square kilometers. About 90 percent of that ice sits on land. The rest, though still firmly attached to the continent's ice sheet, floats in the surrounding seas, says Stan Jacobs, a glaciologist at Lamont-Doherty Earth Observatory in Palisades, N.Y. These ice shelves, many of which are hundreds of meters thick, occupy about 44 percent of Antarctica's coastline. In some places, their edges—where Connecticut-size icebergs occasionally snap free and head for warmer climes (*SN*: 5/12/01, p. 298)—are hundreds of kilometers from land.

Shipbound Antarctic scientists, even those on icebreakers, can't

directly explore areas covered by ice shelves. The scientists generally remain at the shelves' fringes, measuring the temperature and salinity of the water flowing in and out of the sheltered depths, says Jacobs. As useful as that information may be, it doesn't give scientists direct data on the water under Antarctica's ice shelves. AUVs can gather such data and at the same time map the seafloor and measure ice thickness, he notes.

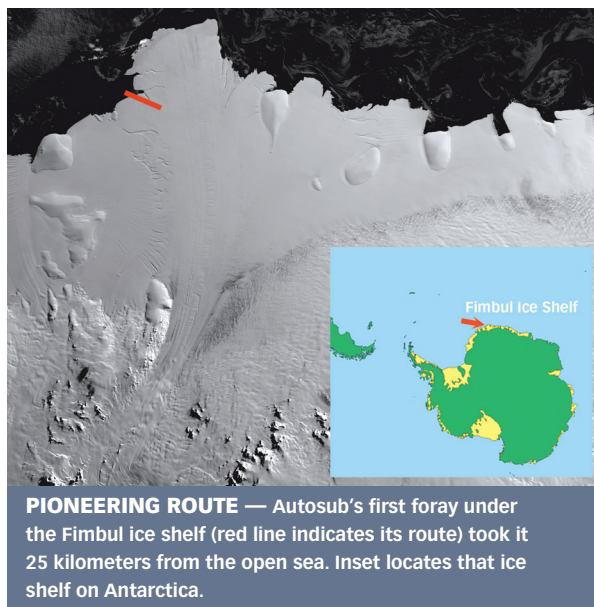
Researchers have drilled holes through ice shelves and dropped instruments into the frigid water beneath, but even that's been done at fewer than 20 sites in Antarctica in the past half-century, says Keith W. Nicholls, an oceanographer with the British Antarctic Survey in Cambridge, England. Such efforts have provided data about single spots over extended periods of time, but scientists have also longed for water-temperature and salinity data gathered over wide areas during short periods of time, he notes.

So, in February 2005, Nicholls and his colleagues sent an AUV

called Autosub on an extended jaunt under the Fimbul ice shelf, which flows into the South Atlantic. Autosub was designed for use in open seas, so for the under-ice missions, engineers added sonar equipment so that the AUV could navigate by features on the seafloor, says Nicholls. Deployed from a ship near the edge of the 50,000-km² ice shelf, Autosub traveled about 25 km into the ice-covered cavity before turning around and coming out along the same path. On the inbound leg of the mission, the AUV cruised at about 150 m above the ocean floor. Then, Autosub rose several hundred meters to a point near the ice shelf's lower surface, turned around, and headed back to the ship. For most of its outbound trip, the AUV flew about 100 m below the ice.

Sonar readings indicated that that shelf's undersurface is, for the most part, smooth. Any bumps, cracks, or other features in those regions are no more than a few millimeters across, says Nicholls. The smooth complexion isn't surprising, he notes, because an ice surface in contact with water is naturally self-leveling. The deeper a chunk of ice sticks down into an ocean, the higher the water pressure on it and the more quickly it melts. So, features that hang like icicles underneath the shelves tend to disappear. Conversely, water within an inverted crevasse in the ice freezes readily and fills the gap with smooth ice because it's shallower and therefore experiences less pressure than water below it.

In some areas, however, the AUV spotted kilometer-wide sections of ice that were unexpectedly riven with fissures as deep as 30 m. "We're still unsure about what this means," Nicholls



PIONEERING ROUTE — Autosub's first foray under the Fimbul ice shelf (red line indicates its route) took it 25 kilometers from the open sea. Inset locates that ice shelf on Antarctica.

NICHOLLS

notes. "Nobody ... can come up with an idea of how such rough terrain is maintained."

The jumbled topography is probably a sign that melting rates in that part of the ice shelf are high, says Nicholls. However, because the rough-ice regions have well-defined edges, the chaotic patches of ice don't seem to be a result of ocean currents or widespread turbulence beneath the ice shelf.

Data from above the ice hint at what forces have roughed up the lower surface. By comparing the navigational data gathered by the AUV with satellite images of the same region, the scientists noted that the rough patches show up directly beneath shallow depressions in the upper surface of the ice shelf. These features, called flow traces, seem to have been created as the ice slowly spilling from the continent thinned after it passed over, around, or between geological features such as small islands, says Nicholls.

Flow traces are present on top of all ice shelves, so the presumption that all ice shelves are smooth underneath may need to be reassessed, Nicholls and his team assert in the April 28 *Geophysical Research Letters*. That's hardly a trivial matter, since it would mean that computer models that simulate the flow of ocean currents beneath ice shelves may need to be adjusted to incorporate additional fluid friction caused by large areas of rough ice.

COLD HEAT When the water beneath ice shelves is barely above the freezing point—for seawater, that's about -1.9°C —only a few centimeters of ice melts from the shelves each year. Scientists estimate that for each 0.1°C rise in the underlying water's temperature, an extra 1 m or so of ice could melt over the course of a year (*SN: 11/1/03, p. 278*).

Data that Autosub gathered on its 2005 voyage under the Fimbul ice shelf indicate that the water there was somewhat warmer and saltier than water that ship-based oceanographers sampled just off the ice shelf's edge, says Nicholls. Therefore, he suspects that the water beneath the ice shelf must have migrated there during the previous winter, when storms may have blown unusually warm and salty waters to the region from depths farther offshore.

The water could also have come from a current meandering along an unusual path through the region or a passing ocean eddy, says David M. Holland, an oceanographer at New York University. The water in the center of those whirlpool-like ocean features, sometimes transported from distant regions, can be 1°C or more warmer than the surrounding ocean (*SN: 6/14/03, p. 375*).

Holland and his colleagues used sound-echo data gathered atop the Fimbul ice shelf to construct a computer model of the region that includes the shelf, the waters beneath it, and the underlying seafloor. Then, they used that model to predict 11 years' worth of ocean-circulation data under present conditions.

After the first 4 years, according to the model, the average temperature of the water under the ice stabilized at about -1°C , almost a full degree warmer than seawater's freezing point. In areas near where the floating ice shelf touches the seafloor near the Antarctic shore, a layer of ice more than 10 m thick melted each year, the researchers reported in the Jan. 15 *Journal of Geophysical Research (Oceans)*. In the team's model, on average, the entire ice shelf thinned by almost 2 m per year, they note.

The water temperature actually measured by Nicholls and his team using Autosub was a degree or so warmer than the average temperature estimated by the Holland team's model. The model

could be wrong, says Holland. However, the apparent difference between the two figures may not be significant, he notes.

First of all, the average temperature calculated in the team's simulation is an average for the entire year; the AUV may have taken its measurements during a warm spell. Also, the 50-km route taken by Autosub may have fallen entirely within a small, relatively warm patch of water beneath the 50,000-km² ice shelf. Finally, weather conditions in the region during the Nicholls team's expedition may have enabled exceptionally large quantities of warm, deep water from offshore to spill into the cavity beneath the ice shelf, says Holland.

Furthermore, the computer model doesn't now include long-term variations such as meandering ocean currents, occasional eddies, or significant changes in weather patterns. And it doesn't offer ways to incorporate sudden changes in ice shelf geometry, says Holland. "The model isn't as advanced as we'd like, but these aren't insurmountable problems," he notes.

LOSS OF A PIONEER Alas, Autosub's first round trip under Antarctica's Fimbul ice shelf was its last. On the second of several missions planned for the 2005 expedition, the AUV didn't come back. Scientists are still trying to figure out what went wrong, and biologists who'd hoped to use the AUV's camera to get a closer look at the seabed on subsequent missions lament that the craft's second excursion met an untimely end. "It's really disappointing, since the first mission had done so well," says Brian Bett, a marine biologist at the National Oceanography Centre in Southampton, England.

Despite the disappearance, Nicholls and his team proved that AUVs can operate under an ice shelf, says Jacobs. Long-range versions of such craft could cover more territory and collect much more data. Scientists could also send them to those areas where the ice shelf meets the Antarctic shore. This small-but-dynamic area is called an ice shelf's grounding line, and researchers are intensely

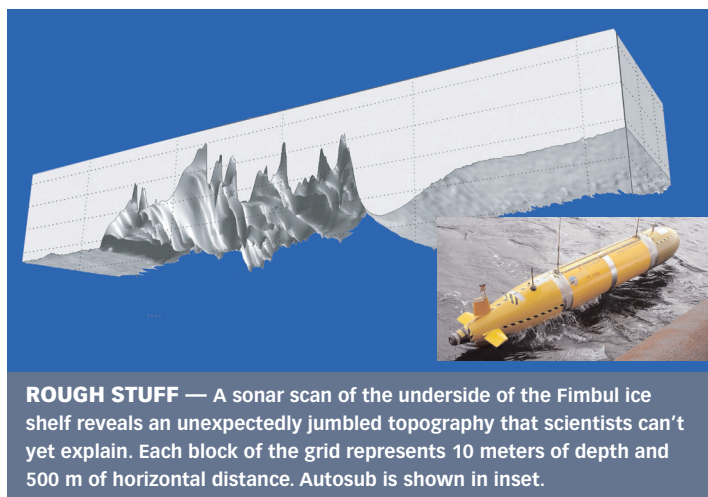
interested in conditions there. For one thing, water samples from this area could indicate how much of the fresh water reaching the oceans in these regions melts from the ice shelf and how much originates as subglacial melt on shore.

Scientists recently put a new Autosub, built at a cost of more than \$1.5 million, through sea trials in the North Atlantic. Its next mission under an ice shelf is scheduled for early 2007, when a team led by Jacobs will visit Antarctica's Pine Island Glacier.

Data from that expedition will enable scientists to compare the conditions there with those under the Fimbul ice shelf. Also, if all goes well, the marine biologists will finally see what kinds of organisms call this environment home. "There are plenty of exciting things to be found down there," says Bett. "It'll be a voyage of discovery."

And what might the researchers find? In March 2005, scientists who explored the ocean uncovered when the Larsen B ice shelf collapsed and drifted away (*SN: 3/30/02, p. 197*) found thick mats of bacteria that were probably nourished by nutrient-rich water seeping from the seafloor (*SN: 8/6/05, p. 94*). Researchers navigating the new AUV under the Pine Island shelf might find similar life forms or others, says Bett. Organisms there might eke out their livings on the organic matter brought in by ocean currents or by scavenging the occasional carcass washed from the open ocean, he says.

"If we knew ahead of time what we were going to see, we wouldn't bother," Bett notes. ■



ROUGH STUFF — A sonar scan of the underside of the Fimbul ice shelf reveals an unexpectedly jumbled topography that scientists can't yet explain. Each block of the grid represents 10 meters of depth and 500 m of horizontal distance. Autosub is shown in inset.

30 HOURS WITH TEAM SLIME MOLD

Field notes from the lumpy, yellow side of biodiversity

BY SUSAN MILIUS

My reporting notes don't usually begin "Cuddle-Up," but this Saturday's project is already careening toward the surreal, and it's not even 9 a.m. I've been instructed to drive to an art deco amusement park just outside Washington, D.C. At Glen Echo Park, I'm to meet my contact at an open pavilion painted powder blue and adorned with the Cuddle-Up sign.

There's some cuddling of coffee cups, but otherwise I just see dozens of people in jeans wearing "Hello" name stickers with "Beetles" or "Moths" or some other taxonomic affinity on them, as if for a party game. With weird luck, I almost immediately spot the label "Lance Biechele, Fungi," on a compact, silver-haired man in green rubber boots.

We've never met before, but he's agreed to let me tag along as he leads colleagues to search for as many fungi and slime mold species as they can find in the next 30 hours. The searchers will focus on the national parks in Virginia and Maryland along a 15-mile stretch called the Potomac Gorge, just before the river slides by Washington.

While Team Slime Mold/Fungus scrapes bits off rotting logs, 18 other teams will stalk their own taxonomic targets. This is a BioBlitz, the biodiversity version of a barn raising. Field biologists and experienced hobbyists volunteer en masse for a day or two to make a rough inventory of both commonplace and odd species as a baseline for conservation planning. (Check local parks to see if one nearby needs volunteers.)

Somewhere in this mob is Sam Droege, who says that he coined the term *BioBlitz* 10 years ago. A biologist at the Patuxent Wildlife Research Center in Laurel, Md., today he's scheduled to lead Team Ant, Bee, and Wasp. Since that 1996 survey in another Washington-area park, BioBlitzers have convened at dozens of spots, from New York's Central Park to New Zealand's Waitakere City. Droege says, "Whenever you get that many biologists together, they'll find something rare."

LEAST LIKELY The teams quiet and nudge their backpacks and buckets and long-handled nets into a horseshoe around the Cuddle-Up stage. Representatives from the sponsors, the National

Park Service and the Nature Conservancy, make last-minute announcements. Beetle specialist Arthur Evans of the Smithsonian Institution in Washington welcomes the more than 100 volunteers whom he has recruited to the BioBlitz. There's no bird team, and just two mammal specialists will join in, looking only for two, long-lost species. This weekend, Evans reminds us, will be devoted to "undersurveyed" organisms. So who better to follow than Team Slime Mold?

YELLOW STUFF Team Slime Mold aggregates quickly, and before we've reached the parking lot, Biechele clocks the first find. He points out a hand-size patch of lumpy yellow crust on mulch in a flowerbed. It's a slime mold, *Fuligo septica*, which he cheerfully tells me is sometimes called "dog-vomit slime."

Unlike a fungus, each slime mold at some stage turns into a creeping blob that engulfs its prey and slithers on like a B-movie science-fiction alien. Biechele, from Salisbury, Md., has the reputation of being a good man to call when blobs start oozing. However, the slime mold that he's found is past its blob phase and is starting to form spores by thickening into a lumpy mass indicative of its other common name, scrambled-egg slime.



WHO'S THERE? — The BioBlitz survey sought to reveal overlooked biodiversity in a wild area west of Washington, D.C.

WEATHER As we start off again to the parking lot, William Roody, a field biologist from Elkins, W.Va., who works for the state's Division of Natural Resources (DNR), suggests that may be it for today's findings. He has a merry smile, so it takes me a minute to realize that he's not entirely kidding.

For one thing, it's too early in the year, he explains. The big flush of showy fungus species around here, the equivalent of peak spring wildflowers, comes after rains in late

summer, but now it's only June. With so many organisms to consider, one BioBlitz schedule never fits all.

Roody also says, "It's too dry." I'm floored. The early summer baked the Washington region, but for the past few days, torrential rains have drowned us. Today is so humid that mushrooms might soon be growing in my hair.

Roody again gently explains that the whole post-rain burst of mushrooms doesn't just pop up instantly. The tangled threads of tissue that make up a fungus can take several days or a week to send up the fruiting body that we routinely call a mushroom. Team member Jon Ellifritz of West Hyattsville, Md., the president

of the Mycological Association of Washington, agrees that it's likely to be tough hunting. As far as I can tell, though, the whole team is looking forward to it.

THEY'RE OFF In a parking lot on the Virginia side of the Potomac, the crew is unloading gear. Biechele, Roody, and his West Virginia DNR colleague Donna Mitchell, for example, will be carrying baskets like Little Red Riding Hood's. Wide-mouthed baskets are a traditional choice for fungus hunters, who worry about deep piles crushing a bottom layer.

Biechele is dismayed that I'm not carrying a magnifying lens. Nobody's going to want my opinion about a detail for identification, but apparently I'll miss the beauty of the finds. A mushroomer without a magnifying lens is like a birder without binoculars. Team member Richard Gaines of Olympia, Wash., offers me his spare.

The team's most esoteric equipment, though, is the waxed paper sandwich bag, which has practically been driven to extinction by the plastic bag. Yet plastic bags collect condensation on the inside, I'm told, and specimens rot faster.

As the team heads into the woods, I trail after Biechele and Gaines. We're barely two strides out of the parking lot when Biechele lunges at an orange fleck in the grass by the path. He straightens up, glaring at what turns out to be a blossom that's fallen off its stem. "Flower mushroom," he snorts and tosses it aside.

He next swoops upon a clump of tawny, nickel-size parachute tops on dark stems. He deftly dislodges a sample and passes it to Gaines, who doesn't so much look at it as sniff at it. They then discuss the smell, which might resemble garlic's and could matter in the final identification.

"People think you have to go deep into the woods to find mushrooms," Biechele says. "But all these manhandled places"—he gestures around us at the intersecting paths and mowed-grass edges—"are great."

DOLDRUMS Despite the greatness of manhandled spaces, the power of drought seems greater. We do a lot of tramping and poking but not much picking. Biechele bursts out of the shrubbery, empty handed, saying something about becoming a birdwatcher.

LOG ON We've jagged southward into older trees. In a clearing where a giant trunk has fallen, Biechele spots another of the scrambled-egg slime molds. He shows how to tell which way it was crawling by looking at its tracks, a twinkle of drying flecks to one side.

Then, Biechele and Gaines have a thrilling 15 seconds. Farther down the log they find a fleshy pink lump the size of a fingertip rising out of the bark. It's a *Lycogala epidendrum* slime mold, also called toothpaste slime. Puncturing the lump at just the right stage lets out a fat cylinder of soft pink innards.

And several inches away lie the fruiting bodies of a wood hair slime mold (*Stemonitis fusca*). To me they look like a tight cluster, barely an inch high, of several dozen miniature hot dogs on sticks.

TICKY-TACKY After a lunch at picnic tables, the team moves to the Maryland side of the Potomac park. As members straggle through the open woods, the youngest, Susanna Rhodes, 15, of Chesterfield, Va., glimpses something bright on a fallen branch. It turns out to be eyelash cup fungus (*Scutellina scutellata*), an overlapping array of dish-shaped red dots, each encircled in a dark fringe.

I see team members around a stocky mushroom with a purplish-red top and ultrawhite underparts. As I get closer, Biechele hands it to Nicole Cintas, a plant pathologist at Northern Virginia Community College in Alexandria.

Cintas bites its edge (do not try this at home). There's silence for a minute as she chews and stares into the middle distance. "It's hot," she says finally, turning for a discrete spit.

The mushroom belongs to the Russulaceae family, and Ellifritz croons the '60s tune "Little Boxes," revised as the mushroomer's lament, "Little Russulas": "... There's a red one and a yellow one, And they're all made out of ticky-tacky, And they all look just the same."

Biechele says that some 200 species of the *Russula* genus are difficult to tell apart. Identification rests on characteristics such as degree of red-pepper heat—plus heroics at the microscope.

MIXED BOUQUETS About 5 p.m., the team heads back to the amusement park, which will serve as a field laboratory for the weekend. It will also host a wedding this evening, and guests in suits and cocktail dresses stream in

along with the BioBlitzers and their specimens. A man in a dark suit with an orchid boutonniere gives me a wide berth but a friendly smile.

In a building near the Cuddle-Up, rows of long wooden tables and a diversity of paraphernalia—from bait buckets and razor blades to high-intensity lamps and a hefty spider in a jar—give the air of a frantic countdown to a natural history museum's rummage sale.

The slime mold/fungus team's tables stand out against a chaotic background because the team is covering them with white paper plates. Each plate holds one of the day's specimens, and team members begin to print Latin names where the coleslaw might go.

Discussion is lively, and I see names crossed out and replaced, or

equal signs added with another Latin name from a revision of the nomenclature. Mushroom clubs for years have relied on this picnic-plate system to display the treasures from a day's foraging.

RAIN CHECKED On Sunday morning, rain clatters on the car roof as I drive back to the park. Inside the makeshift lab, the slime mold team frets about the weather, which is even more too wet while still too dry, and opts to work on identifying the specimens from yesterday.

Many of the other teams have also given up trying to collect in the rain and are working on their identifications. But Team Crayfish, already destined to be soggy, is having a splendid day. But Zachary Loughman of the Oglebay Institute in Wheeling, W.Va., explains that the group has been tracking a thug crayfish species that arrived as bait and is harassing the Potomac Gorge's three native crayfish species.

As we talk, team members make practiced grabs into yellow bait buckets and lift out twisting specimens, with claws poised to snap. The team shows off a 10-centimeter-long native devil crayfish, known by its lipstick-red streaks. Oglebay intern Christopher Vopal acts out the technique for their capture, pretending to poke his arm down an entrance tunnel into the crayfish's inner chamber, then bouncing his fist in the pool there as if plunging a toilet, until the resident devil ventures out of its hole to investigate.

The Potomac Gorge isn't just about water though, says one of the beetle surveyors, Warren Steiner of the Smithsonian. He focuses



LAB FOR A DAY — A hall at an old amusement park serves as the BioBlitz lab, with Team Slime Mold's tables of paper plates at center.

on what he calls microdeserts, easily overlooked patches that could provide vital homes for drought specialists. Rocky outcroppings along the Potomac's edge rank as prime microdeserts, he says.

During the night before the rain, Steiner and Jil Swearingen of the National Park Service had carried black lights and white sheets out to some such rocky terrain. Picking nocturnal insects off a disco-glowing sheet yielded specimens that they wouldn't have otherwise found, he says. The downside, though, was lugging the equipment back, with only wavering headlamps, over the boulders known locally as the Billy Goat Trail.

Another team has collected a species not yet named by science—though science seems to be taking its sweet time in doing so. It's a moth, "a tiny, nondescript thing," says John Brown of the Smithsonian, leader of Team Moths and Butterflies. The creature was probably first collected on an island in the Potomac 100 years ago. Museums have six or seven long-held specimens, but they're what might otherwise be called moth-eaten. A Smithsonian colleague has a publication in the works that will finally give the moth its own scientific name. He'll be delighted, says Brown, to have a fresh moth as the reference specimen.

TALLY HO Back in the hall's fungus zone, last-night's rough-draft picnicware has been replaced with new paper plates lettered in black marker with the team's current consensus on the species

names. While Mitchell huddles over a microscope considering a problem *Russula*, Biechele photographs the plates and specimens for the record.

Despite all the obstacles, Biechele's preliminary count is 5 slime molds and 51 fungi. The most intriguing find, collected by Ellifritz,

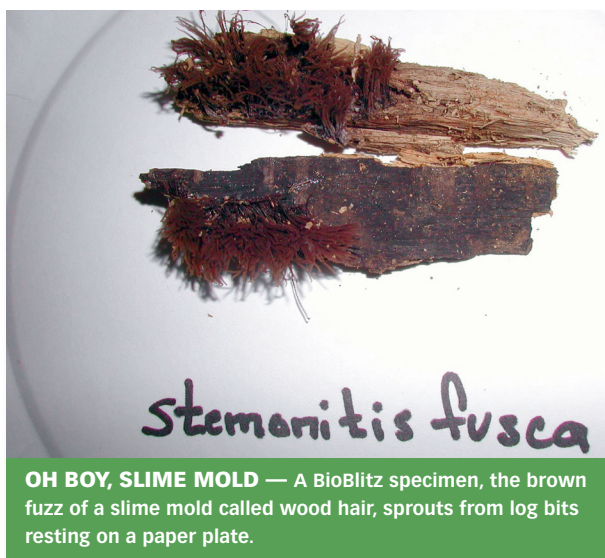
belongs in the general group of polypores, wood-loving fungi that bear spores in little tubes on their undersides. "I've only seen it once before in 30 years," says Roody. He's going to have to check to see whether it has a species name.

At 3 p.m., the collecting phase of this BioBlitz ends, and the preliminary score for all teams combined stands at just over 1,000 species identified. No luck on the missing mammals, but other teams have good news, such as the first record of a particular fly east of Iowa plus two previously unrecognized moist habitats called seeps with two rare invertebrates. More exciting news: two rare land snails and abundance of a plant that was first described only 6 years ago.

The collectors plan to tie up the loose ends on their identifications in the coming months and then publish a journal article on their finds.

MAYBE NEXT TIME ... Three days later, as the weather is finally clearing, I walk out of the *Science News* offices about half an hour's drive from the Gorge. Before I reach the end of the block, I spot four kinds of fungi. ■

BIECHELE



OH BOY, SLIME MOLD — A BioBlitz specimen, the brown fuzz of a slime mold called wood hair, sprouts from log bits resting on a paper plate.

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OF NOTE

BIOMEDICINE

Male circumcision could avert millions of HIV infections

In the next 10 years, universal circumcision of men and boys in sub-Saharan Africa could prevent 2 million new cases of infection with the human immunodeficiency virus (HIV) and avert 300,000 deaths. Over the following 10 years, it could prevent 3.7 million additional HIV infections and 2.7 million more deaths.

The estimates, reported in the July *PLoS Medicine*, include women because they would be less likely to get infected if fewer men were HIV-positive, says coauthor Brian G. Williams, an epidemiologist at the World Health Organization in Geneva, Switzerland.

Last year, researchers reported that circumcision reduces by more than half the risk of a sexually active man acquiring HIV (*SN: 10/29/05, p. 275*). By removing the foreskin, the procedure eliminates cells that are easily infected.

Williams' team says that one-quarter of the lives saved would be in South Africa, where only about one-third of males are circumcised and nearly 25 percent of adults are infected with HIV. Much of the remaining improvement would be in countries in eastern and southern Africa that have even lower circumcision rates.

The full impact of such a program "wouldn't be seen for 15 to 20 years," Williams cautions. —N.S.

BEHAVIOR

Bullying leaves mark on kids' psyches

Between ages 5 and 7, being the victim of a bully at school uniquely contributes to a child's behavioral and emotional problems,

according to observations of children before and after 2 years of bullying.

Youngsters targeted by bullies often enter school already showing signs of maladjustment, but those problems worsen and expand over 2 years of bullying, say psychologist Louise Arseneault of the Institute of Psychiatry in London and her colleagues.

The researchers studied 2,232 English and Welsh children born in 1994 and 1995. The sample consisted of pairs of healthy identical and fraternal twins. Experimenters obtained reports from mothers and teachers about the children's behavior problems and school adjustment at age 5 upon entry into school and again at age 7.

At the second assessment, mothers and teachers identified 272 children—14 percent of the sample—as being regularly excluded from groups and games, beaten up, or otherwise bullied. Another 137 kids—6 percent of the total—were both victims of bullies and bullies themselves. Arseneault's team compared these groups with 1,387 children who were neither victims nor perpetrators of bullying.

Compared with unbullied kids, those bullied by others displayed more social withdrawal, physical complaints, symptoms of anxiety and depression, and unhappiness at school at ages 5 and 7, the researchers report in the July *Pediatrics*.

Children who were both victims and practitioners of bullying had the highest rates of behavioral and emotional problems, as well as pronounced academic difficulties.

From age 5 to 7, signs of maladjustment substantially escalated in all bullied children. These findings emphasize the need for bullying-prevention programs (*SN: 5/27/06, p. 328*), the researchers contend. —B.B.

BIOCHEMISTRY

Old drug, new use

An antihistamine introduced in 1983 shows activity against malaria in mice. Researchers discovered the drug's activity by screening a library of more than 2,000 existing drugs, a strategy that could reveal alternative uses for already approved drugs against other diseases.

David J. Sullivan Jr. of Johns Hopkins University in Baltimore and his colleagues

assembled the library—the largest yet reported—from more than 1,900 U.S.-approved drugs and 750 others approved abroad or used in human trials. They then looked for compounds that stop the growth of *Plasmodium falciparum*, the parasite that causes malaria in people.

The screening identified the antihistamine astemizole, which was removed from American and European markets in the late 1990s because of potential damage to the heart.

Sullivan and his coworkers tested the drug in infected mice. Astemizole reduced the number of parasites by 80 percent in mice infected with a strain sensitive to chloroquine, one of the primary antimalaria drugs, and by 44 percent in mice with chloroquine-resistant parasites, the researchers report in the August *Nature Chemical Biology*.

The researchers plan to conduct more studies with astemizole. Meanwhile, they will expand their drug library to screen for activity against diseases that primarily affect the developing world, says Sullivan.

Such screens are "a really good idea," comments Jonathan L. Vennerstrom, a medicinal chemist at the University of Nebraska in Omaha.

The identification of astemizole could be a starting point for a drug-development project, he adds. Chemical analogs of the drug might have better activity and less toxicity than astemizole itself, he says. —A.C.

BIOMEDICINE

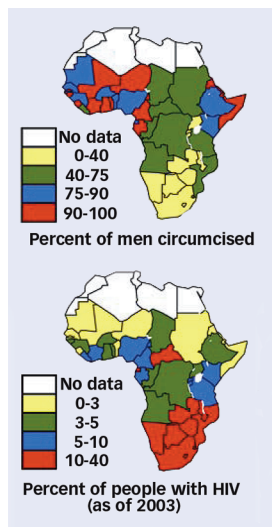
Device spots sponges left behind

Major operations require dozens of sponges—pieces of gauze used to mop up blood—and surgical teams keep track of them by counting how many go in and come out. However, sponges are the surgical objects most often left in patients. Surgeons may soon have a new way to detect sponges accidentally left inside a patient.

Gauze left inside a patient can cause inflammation, infection, and intestinal blockages. An earlier study showed that 57 patients in the United States died from foreign bodies left inside them in 2000.

In the July *Archives of Surgery*, researchers report that in tests during operations, doctors promptly located stray sponges labeled with radiofrequency identification chips.

The physicians tested the new technology on eight volunteers who were undergoing abdominal surgery. Near the completion of each operation, one surgeon



OPPOSING TRENDS

Male circumcision is common in West Africa but not in southern Africa (top). The reverse is true of HIV prevalence (bottom).

OF NOTE

looked away as another placed a few tagged sponges and one untagged sponge inside the surgical cavity and then closed, but didn't suture the wound. The labeled sponges had radiofrequency tags the size of a nickel sewn into them.

The other surgeon then used a wand to scan the patient externally for the labeled sponges. The surgeons located all the tagged sponges, says coauthor Alex Macario, an anesthesiologist at Stanford University School of Medicine.

The new device will require regulatory approval. —N.S.

PALEOBIOLOGY

Rarity of fossils of young tyrannosaurs explained

Paleontologists have unearthed only a few juvenile tyrannosaurs, and a new analysis suggests why: Unlike many other creatures both modern and ancient, a large percentage of those meat-eating dinosaurs survived into adulthood.

Many dinosaur bones, including those of *Tyrannosaurus rex* and its relatives, show growth rings, just as trees do, says Gregory M. Erickson, a paleobiologist at Florida State University in Tallahassee. Now, he and his colleagues have counted growth rings in leg bones to determine the age distributions of four tyrannosaur species.

The 22 specimens of *Albertosaurus* unearthed at a quarry in Alberta ranged in age from 2 to 28 years, the researchers estimate. The creatures' ages at death indicate that between the ages of 2 and 13, the dinosaurs died at an average rate of about 4 percent each year. Thereafter, the animals began to die at a rate of 10 percent or more per year. Previous research suggests that *Albertosaurus* reached sexual maturity at age 14, says Erickson. The new data indicate that about 70 percent of the dinosaurs made that milestone.

"These creatures started dying more quickly just as they were reaching their prime," says Erickson. Similar trends apply to *T. rex*, *Gorgosaurus*, and *Das-*

pletosaurus, the researchers note in the July 14 *Science*.

Tyrannosaur juveniles probably survived so well because they grew quickly, says Erickson. For example, by the time that an *Albertosaurus* was age 2, it rivaled in size the adults of other predators living then, he notes. The demands of adulthood, including conflicts for territory and mates, probably brought about the accelerated death rates among older tyrannosaurs. —S.P.

EPIDEMIOLOGY

Obesity correlates with psychiatric disorders

Already linked to diabetes and heart disease, obesity is also associated with heightened risks of major depression and bipolar and panic disorders, a national survey shows.

Previous surveys demonstrated the obesity-depression link. The new survey of about 9,000 adults 18 and older from across the United States extends the association to bipolar disorder, general anxiety and panic disorder.

Gregory Simon of the Group Health Cooperative in Seattle and his colleagues

found that obese adults were 25 percent more likely than normal-weight adults to report any of the mood or anxiety disorders, including depression. However, that same population of obese adults was 25 percent less likely than normal-weight people to report drug or alcohol abuse during their lifetimes.

Interestingly, says Simon, white people and high-income individuals showed the strongest link between obesity and psychiatric disorders, even though those two groups generally have a low rate of obesity. The team's analysis took into account participants' age, sex, and

smoking status, the researchers report in the July *Archives of General Psychiatry*.

The team didn't try to establish cause and effect between obesity and psychiatric disorders, but "it's pretty likely that things go in both directions," says Simon. —E.J.

TECHNOLOGY

Litmus test gets tiny

By coating a nanoscale glass ball with gold and studding that metal with a forest of light-sensitive molecules, researchers in Texas have created what they say is the

world's first nanoscale pH meter. The litmus paper familiar from high-school chemistry class and other pH meters gauge how acidic or basic a solution is.

Injected deep into living tissue, the new nanobubble could take the chemical pulse of a single cell, potentially signaling conditions such as cancer or organ rejection, the inventors suggest.

The molecules of para-mercatobenzoic acid (pMBA) that make up the device's light-sensitive forest emit radiation when hit by an infrared laser beam. The spectrum of the pMBA's infrared emissions changes subtly in response to the pH of the surrounding fluid. The gold-coated core of the device amplifies the emissions.

"It's a high-precision device," says Naomi J. Halas of Rice University in Houston, who led its development. Injected into tissue, such meters could enable physicians or biology researchers to monitor cell pH by shining a laser on cells of interest and analyzing the return signals, she adds.

Halas and her colleagues describe their invention in an upcoming *Nano Letters*. —P.W.

ASTRONOMY

Double disks

Astronomers have confirmed that the nearby star Beta Pictoris has two disks of dust orbiting it, each of which contains debris that's probably the remnants of planet formation. The disks orbit the star at slightly different inclinations, an indication that if Beta Pictoris harbors unseen planets, they circle the star in more than one plane.

Scientists first imaged a single debris disk around Beta Pictoris in 1985. A decade later, the Hubble Space Telescope found an apparent warp in the disk. Researchers have suggested that this warp is actually a second dust disk, tilted at about 4° from the main disk (*SN: 10/9/04, p. 227*).

New images from Hubble's Advanced Camera for Surveys provide firm evidence of the second disk, David Golimowski of Johns Hopkins University in Baltimore and his colleagues report in the June *Astronomical Journal*. To image the faint disk, the team had to block the glare from the star, which lies 63 light-years from Earth.

A computer model developed by a separate team of researchers suggests that the second disk was created when a massive, unseen planet in a tilted orbit lured bits of rock and ice—leftovers from the planet-making process—from the main disk. The chunks continually collide to replenish the dust, which the star's radiation constantly pushes away.

Finding a tilted disk isn't a great surprise, notes Golimowski. Planets in our solar system have orbits inclined to that of Earth by several degrees. —R.C.



LIVE FAST, DIE OLD

More than 70 percent of the tyrannosaurs that reached age 2 lived to reach adulthood at age 14, a new study of fossils such as this *Gorgosaurus* suggests.

Books

A selection of new and notable books of scientific interest

THE COMPLETE GREEK TEMPLES

TONY SPAWFORTH

This richly illustrated book celebrates the majesty of Greek temples. The colonnaded edifices, invented as a building style in 600 B.C., served that ancient civilization as a symbol of prestige.



Spawforth, a professor of ancient history, traces the diffusion of classical Greek architecture throughout the Mediterranean region and East Asia. Construction of the temples began to decline in the 4th century. However, the structures

remained a hallmark of Greek culture and were a symbol of Alexander's imperial vision during the Hellenistic age. After the rise of Christianity, some temples were used as churches. Others, however, were destroyed for the sake of vengeance and the valuable construction materials they contained. The book ends with a tour of the various remaining temples located in Italy, Sicily, Greece, and Asia Minor. *Thames & Hudson, 2006, 240 p., color plates, hardcover, \$40.00.*

SHADOWS OF REALITY: The Fourth Dimension in Relativity, Cubism, and Modern Thought

TONY ROBBIN

This book explores models of fourth-dimensional space and how they are applied in physics and art. The most routine four-dimensional view of space is called the Flatland model. Robbin contrasts this model with the projection, or shadow, model. In it, parallel lines meet at infinity and create the perspective found in real life. Pablo Picasso employed the projection model when he invented cubism, writes Robbin, an artist and



computer scientist. Mathematician Hermann Minkowski and physicist Roger Penrose developed the model. Physicists now use it to explain the quantum world, Robbin writes. He reviews the history of four-dimensional geometry, explains how four-dimensional models can envision a person walking through a wall, and explores the fourth dimension in art. The author summarizes how the development of computerized models can aid in the visualization of four-dimensional geometry. *Yale, 2006, 137 p., b&w illus., hardcover, \$40.00.*

THE GOD EFFECT: Quantum Entanglement, Science's Strangest Phenomenon

BRIAN CLEGG

Albert Einstein considered the idea of quantum entanglement, like much of quantum physics, to be ridiculous. The phenomenon asserts that two particles can be connected so that changes in one are instantly reflected in the other, even if those two particles are light-years apart. Despite that strangeness, Clegg, an author with a background in physics, reports that entanglement has now been well documented. Known as "the God effect,"

entanglement is an area of constant development in current physics because of its astounding potential real-life applications, Clegg asserts.

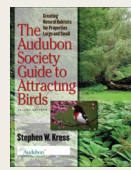


For instance, entanglement could make possible codes that are unbreakable, instantaneous communication across any distance, and even teleportation. The author describes the history of the theory from its origins in 1935 as Einstein's attempt to discredit quantum physics. Physicist John Bell nevertheless took up the cause of entanglement and prompted other scientists to test the theory in various thought and laboratory experiments. *St. Martin's, 2006, 258 p., hardcover, \$24.95.*

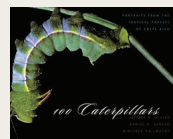
THE AUDUBON SOCIETY GUIDE TO ATTRACTING BIRDS: Creating Natural Habitats for Properties Large and Small

STEPHEN W. KRESS

This guide offers advice for improving natural habitats within a home's yard or a larger area, such as a farm or wildlife refuge, in order to attract an assortment of birds. Kress, vice president for bird conservation at the National Audubon Society, emphasizes that with nearly 80 percent of the United States' wildlife habitat sitting on private lands, the actions of landowners will determine the fate of most North American bird species. Kress describes the factors, such as food, cover, water, and nesting sites, that limit the number of animals that can survive in a given habitat. He offers tips for minimizing human influence on these limiting factors. He offers tips on forest management (including how to maintain nesting trees and encourage forest expansion), grassland management (when and when not to mow), and shrubland management (such as arranging plantings). The book includes tables of plants that readers could cultivate. Kress ends the book with suggestions for building bird feeders and structures for nesting and roosting. *Cornell, 2006, 466 p., b&w illus., paperback, \$24.95.*



authors, who are conservation biologists, selected 100 of the most colorful and distinctive for their gallery of full-page, finely detailed photos at the front of this book. At the back are pages, about one per species, describing each specimen and—in an unusual twist on butterfly books—a small rendering of each one's adult form. What results is an homage to some of nature's most fascinating creatures with some of the weirdest appearances. *Harvard, 2006, 264 p., color plates, hardcover, \$39.95.*



100 CATERPILLARS: Portraits from the Tropical Forests of Costa Rica

JEFFREY C. MILLER, DANIEL H. JANZEN, AND WINIFRED HALLWACHS

This collection of more than 100 full-color portraits of plant-eating machines that develop into moths and butterflies captures the beauty of these creatures up close. Each specimen was collected by the authors or by *gusaneros*, the resident caterpillar collectors of the Area de Conservación Guanacaste in Costa Rica. From the nearly 9,500 species of caterpillars that make their home in the area,

the authors, who are conservation biologists, selected 100 of the most colorful and distinctive for their gallery of full-page, finely detailed photos at the front of this book. At the back are pages, about one per species, describing each specimen and—in an unusual twist on butterfly books—a small rendering of each one's adult form. What results is an homage to some of nature's most fascinating creatures with some of the weirdest appearances. *Harvard, 2006, 264 p., color plates, hardcover, \$39.95.*

LETTERS

Squeeze, please

It would seem to me that instead of looking to minimize the effect of grapefruit juice in slowing the metabolism and elimination of drugs, one could cut drug dosages by taking advantage of it ("Nabbed: Culprit of grapefruit juice–drug interaction," *SN: 5/20/06, p. 317*). Grapefruit juice costs less than any drug and has far fewer possible side effects. This could only benefit the patient by lowering drug exposure and costs.

SHMUEL ENGELSOHN, JERUSALEM, ISRAEL

"This is probably not a good strategy," says researcher Paul B. Watkins of the University of North Carolina at Chapel Hill. Both the ingredients in juice and people's reactions to them are too variable to guide a precise reduction in drug doses. —B. HARDER

Let's drop the little one?

While reading "Gripping Tale: Metal oozes in nanotubes' grasp" (*SN: 5/27/06, p. 326*), I pondered what would happen if fissionable elements were the core crystals of the nanosqueeze. Would nanoreactors or nanobombs be possible?

VICTOR LAWNICKI, LOUISVILLE, KY.

Florian Banhart of the University of Mainz in Germany notes that a nuclear-fission bomb or reactor requires a critical mass of kilograms of fissionable material—way too much to enclose in a nanotube. —P. WEISS.

Dim view

The lenses in our eyes yellow as we age. Does this affect the light-mediated regulation of our body clocks ("Light Impacts: Hue and timing determine whether rays are beneficial or detrimental," *SN: 5/27/06, p. 330*)? Could it explain any age-related dysfunction?

MIKE SPECINER, ACTON, MASS.

Indeed, it could. The progressive browning of tissue in the eye can end up "acting like yellow-tinted sunglasses," says Elizabeth R. Gaillard of Northern Illinois University. Moreover, the eye's lenses thicken and the pupils shrink with age, further limiting how much light reaches the retina, notes Mariana Figueiro of Rensselaer Polytechnic Institute's Lighting Research Center. Such physical changes "can mute the light-dark signal sent to the body's master clock, presumably contributing to major sleep disturbances in seniors," says Figueiro. —J. RALOFF

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