SCIENCE NEWS

THE WEEKLY NEWSMAGAZINE OF SCIENCE

DECEMBER 24 & 31, 2005
PAGES 401-432 VOL. 168, NOS. 26 & 27

plague of sea squirts
mammoth relations
pollution + fat strains heart
stem cells on the brain

www.sciencenews.org

THE WEEKLY NEWSMAGAZINE OF SCIENCE

SCIENCE NEWS

DECEMBER 24 & 31, 2005 VOL. 168, NOS. 26 & 27

Features

This Week

Of Note

Meetings

Departments

A SCIENCE SERVICE PUBLICATION
PUBLISHER Elizabeth Marincola
EDITOR IN CHIEF Julie Ann Miller
MANAGING EDITOR Keith Haglund
DESIGN/PRODUCTION DIRECTOR Eric R. Roell
PRODUCTION MANAGER Spencer K.C. Norcross
SENIOR EDITOR/ENVIRONMENT/POLICY Janet Raloff
WEB EDITOR/MATHEMATICS Ivars Peterson
BEHAVIORAL SCIENCES Bruce Bower
ASTRONOMY Ron Cowen
BIOMEDICINE Nathan Seppa
LIFE SCIENCES Susan Milius
PHYSICS/TECHNOLOGY Peter Weiss
EARTH SCIENCE Sid Perkins
ENVIRONMENT/POLICY/HEALTH Ben Harder
BIOLOGY Christen Brownlee
CHEMISTRY/MATERIALS SCIENCE Aimee Cunningham
MATHEMATICS CORRESPONDENT Erica Klarreich
COPY EDITOR Linda Harteker
EDITORIAL ASSISTANT Kelly A. Malcom
EDITORIAL SECRETARY Gwendolyn K. Gillespie
WEB SPECIALIST Vernon Miller
BOOKS/ADVERTISING Cait Goldberg
SUBSCRIPTIONS Christina Smith
BUSINESS MANAGER Larry Sigler

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
Send address changes to **Science News**, P.O. Box 1925, Marion, OH 43306. Change of address: Two to four weeks' notice is required—old and new addresses, including zip codes, must be provided.

EDITORIAL, BUSINESS, AND ADVERTISING OFFICES 1719 N St. N.W., Washington, D.C. 20036 202-785-2255; scinews@sciencenews.org.
LETTERS editors@sciencenews.org

SUBSCRIPTION DEPARTMENT P.O. Box 1925, Marion, OH 43306. For new subscriptions and customer service, call 1-800-552-4412.

Science News is published by Science Service, a nonprofit corporation founded in 1921. The mission of Science Service is to advance the understanding and appreciation of science through publications and educational programs. Visit Science Service on the Web at www.sciserv.org.

Mammoth Findings

Asian elephant is closest living kin

A study of a woolly mammoth that died in Siberia several millennia ago has yielded the complete DNA sequence of the creature's mitochondria, the energy factories of the animal's cells. Comparison with the mitochondrial genomes of living elephants indicates that the mammoth is slightly more closely related to the Asian elephant than to the African elephant.

Fossil evidence had suggested that woolly mammoths and the living species of elephants descended from a common ancestor that lived in Africa about 6 million years ago, but the relationship among the three species remained unclear, says Michael Hofreiter, a paleontologist at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. Most anatomical studies suggest that the mammoth is more closely related to the Asian elephant, but analyses of the small amounts of fragmented mammoth genetic material available had hinted at a closer connection with African elephants.

Now, Hofreiter and his colleagues have developed a way to reconstruct a genome from extremely small samples of tattered DNA.

The researchers began with 200 milligrams of bone from a 12,000-year-old mammoth unearthed in northeastern Siberia. They then applied a biochemical reaction that simultaneously made multiple copies of the diverse fragments of mitochondrial DNA from the tiny sample rather than just one fragment at a time. Because the fragments overlapped in many places, the scientists succeeded in sequencing the entire ring-shaped molecule of the mammoth's mitochondrial DNA, which contains about 16,770 base pairs.

While about 95.5 percent of the mammoth's mitochondrial DNA matches that of the African elephant, more than 95.8 percent corresponds to that of the Asian elephant. The tiny difference suggests that the last common ancestor of mammoths and Asian elephants lived about 440,000 years after that creature's ancestors split from the lineage that led to African elephants, Hofreiter and his colleagues report in an upcoming *Nature*.

The new findings are "technically outstanding ... and very impressive for ancient DNA," says geneticist Alfred L. Roca of the Laboratory of Genomic Diversity in Frederick, Md.

Nevertheless, speculations about an animal's family tree that are based on mitochondrial DNA can be misleading, especially when bouts of evolutionary branching took place rapidly in geologic time, says Stephen J. O'Brien, also of the genomics lab in Frederick. He suspects that a comparison of DNA from cell nuclei would provide a more credible account of mammoth and elephant kinship.

Indeed, scientists are now turning their attention to that mammoth trove of DNA information. Using a new generation of high-speed genetic-sequencing machines, evolutionary geneticist Hendrik N. Poinar of McMaster University in Hamilton, Ontario, and his colleagues have assembled partial sequences of one mammoth's nuclear DNA that add up to about 13 million base pairs.

COUSIN HAIRY **A new genetic analysis suggests that the woolly mammoth is more closely related to the Asian elephant than to the African elephant.**

That's less than 1 percent of the creature's full genome, he notes, but at the rate at which the researchers are going, they could put together its entire genome in the next couple of years.

Of the DNA they've sequenced so far, about 98.5 percent matches the corresponding stretches of DNA in the African elephant, Poinar and his team report in an upcoming *Science*. The nuclear genome of the Asian elephant hasn't yet been fully compiled. —S. PERKINS

Pumping Out Hope

Stem cells secrete brain-preserving protein

Because stem cells can grow into many different cell types, researchers have touted them for replacing cells damaged by injury or disease (*SN: 4/2/05, p. 218*). However, some scientists also envision the cells as pumps for delivering drugs. New research suggests that such living drug pumps could eventually treat Parkinson's disease, a progressive neurological disorder with no known cure.

Parkinson's disease occurs when brain cells that produce dopamine malfunction and die. Studies have shown that repeated doses of a protein called glial-cell line–derived neurotrophic factor (GDNF) can protect dopamine-producing cells in lab cultures.

Injections of GDNF into the bloodstream aren't practical because the protein can't traverse the blood-brain barrier, a feature of the circulatory system that shields the brain from many chemicals.

In ongoing trials, researchers have implanted mechanical GDNF pumps in Parkinson's patients' skulls. However, notes neuroscientist Allison Ebert of the University of Wisconsin–Madison, the mechanical-pump method is expensive and requires upkeep, including monthly GDNF refills.

Seeking a new method to transport GDNF to dopamine-making cells, Ebert and her colleagues, led by Wisconsin–Madison neuroscientist Clive Svendsen, slipped extra copies of the gene for GDNF into stem cells that normally make insignificant amounts of the protein. These neural-progenitor cells can morph into several kinds of brain cells.

After testing the stem cells to make sure they produced substantial amounts of GDNF in the lab, the researchers injected them into the brains of rats that had been treated with a slow-acting drug that selectively kills dopamine-producing cells. In a different group of rats treated with the same toxic drug, the researchers injected normal neural-precursor cells that didn't make significant GDNF.

After 2 weeks, Svendsen's team compared the brains of rats in the two groups. Although the new cells seemed to integrate well into the brain tissue of both groups of rodents, the researchers found that those rats with the cells producing abundant GDNF had about 20 percent more surviving dopamine-making cells than the other rats did. These effects persisted when the researchers compared the rats' brains 9 weeks later. Svendsen and his colleagues report their results in an upcoming *Gene Therapy*.

The new study is a "good, important, first step in trying to think about using this approach for Parkinson's disease," says Evan Snyder of the Burnham Institute for Medical Research in La Jolla, Calif., who has used a similar method to turn stem cells

J. TUCCIARONE

into pumps for drugs used to treat other neurological diseases and cancer.

However, notes neurobiologist Don M. Gash of the University of Kentucky in Lexington, the new findings are "good science, but a long way from being good medicine." Gash points out that the amount of GDNF released by Svendsen's stem cells can't currently be regulated, whereas that in artificial pumps can. Either over- or underproduction of dopamine by the cells could eventually lead to adverse effects.

Ebert says that she and other members of Svendsen's team plan to tackle this challenge in future studies. —C. BROWNLEE

Mixing Vessel

Air pollution helps cholesterol clog arteries

When paired with consuming a diet high in fat, breathing polluted air on a regular basis accelerates the accumulation of dangerous plaques in arteries, researchers studying mice have found. The research sheds light on how chronic exposure to air pollution contributes to heart attacks and strokes.

"High fat by itself has a strong negative impact" on blood vessel health, notes Nino Künzli of the University of Southern California in Los Angeles, who didn't participate in the new work. "Air pollution causes additional problems. If you unfortunately have both, you are really badly off."

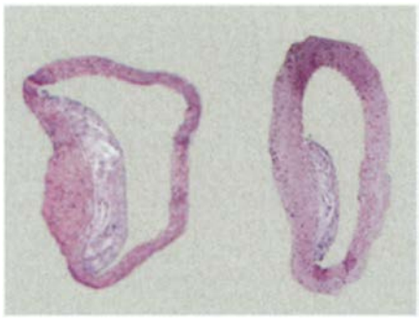
"Obese people in dirty cities presumably form a high-risk group," Künzli adds, but he cautions that the study's findings need to be confirmed.

Past research had indicated that exposure to air pollution inflames and thickens people's artery walls (*SN: 12/11/04, p. 372*) and that people living near major roads have elevated rates of cardiovascular disease (*SN: 11/9/02, p. 302*).

In the new study, Lung Chi Chen of New York University School of Medicine in Tuxedo and his collaborators experimented on mice that have a genetic mutation that makes them susceptible to developing plaques of cholesterol in their arteries. The team fed some animals a standard lab diet and others a diet higher in fat and cholesterol.

For 6 months, the researchers also exposed some of the animals to polluted air for 30 hours per week. The other mice breathed only filtered air.

To generate the polluted air, the experimenters took air from outside their rural facility and concentrated all particles smaller than 2.5 micrometers in diameter.



CLOGGED CONDUITS **Cross sections of arteries show more plaque inside a vessel from a mouse exposed to air pollution (left) than from one that breathed filtered air (right).**

The resulting pollution concentrations were about eight times that in the local air but comparable to concentrations in some cities, Chen notes. "These levels can occur very easily in Los Angeles," he says.

Mice fed a high-fat diet and exposed to polluted air developed plaque on 42 percent of their major arteries' surfaces, Chen and his collaborators report in the Dec. 21 *Journal of the American Medical Association*.

By contrast, plaques covered 26 percent of the arteries in mice fed a fatty diet but given clean air. A normal diet and clean air produced plaques on just 13 percent of the arteries' internal surfaces.

Since the overall exposure to small particles by the pollution-breathing mice is only slightly above that acceptable to the Environmental Protection Agency, "the standard is not quite adequate in terms of protecting the public health," Chen says.

"Exposure to relatively low levels of contaminants accelerated the process of depositing plaques," comments Michael T. Kleinman of the University of California, Irvine. He says that the study also hints that air pollution may accelerate plaque formation in the absence of a high-fat diet.

Michael E. Rosenfeld of the University of Washington in Seattle is surprised that air pollution had a statistically convincing effect in the mice only in conjunction with a bad diet. That suggests a synergistic effect between the two exposures beyond either one's individual capacity to trigger rapid atherosclerosis, he says. —B. HARDER

Narrow Escape

Sharp nanogutters hustle out wetness

Researchers in the Netherlands have found that the shapes of nanoscale channels can dramatically affect how quickly a fluid flows through the extremely fine conduits.

Jan C.T. Eijkel of the University of Twente in Enschede and his colleagues found that newly developed nanoscale channels with knife-edged profiles boost water flows and drying speeds.

Nanochannels, which typically have circular or rectangular cross sections, are a type of capillary. As open-ended channels of this kind dry out, water flows as a thin film along the inner walls to the opening.

As the new channels dry, however, most of the water runs in the blade-edge section, enhancing the flow, the scientists report in the Dec. 16 *Physical Review Letters*.

These channels' novel geometry might provide a way to improve the performance of water-containing conduits called heat pipes, used to cool power-hungry microchips, the Twente team proposes. Manufacturers mount such chips on metal plates riddled with these heat pipes.

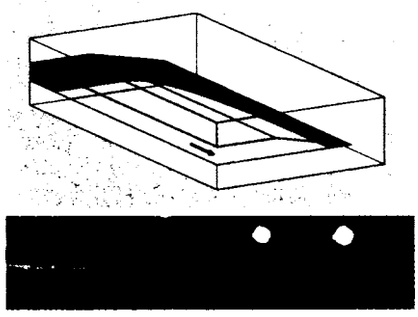
In another potential application, garments, medical dressings, and other items designed to wick away liquid might benefit from fibers etched with sharp-edged grooves, Eijkel suggests.

The team, led by Albert van den Berg, etched troughs only tens of nanometers deep into glass plates and created channels by heat fusing flat glass pieces on top. The channels' unusual profiles had initially resulted from accidental overetching, Eijkel says.

The researchers found that the loss of water occurred hundreds of times as fast as well-known effects such as evaporation of water along the channel could explain. Moreover, the drying rates showed remarkable indifference to ambient humidity.

The high drying rates occur because of the channels' geometry, Eijkel says. As the main body of the channel dries out, its knife-edge section remains filled, serving as a conduit for water to continue to flow to an open end. In a channel of more conventional shape, by contrast, water doesn't collect and flow in one part of the channel.

Bruno Michel of IBM Zurich in



WICKED FAST **Water races along the knife edge of a nanochannel with a novel profile. Micrograph (bottom) shows a 70-nanometer-high channel with a 7° knife-edge angle. Both the diagram and micrograph show the channel's right half.**

EIJKEL ET AL./PHYSICAL REVIEW LETTERS

Rüschlikon, Switzerland, suggests an alternative reason that the new channel shape might prove useful in microchip cooling: The geometry creates a large amount of exposed liquid surface, he says, leading to a high rate of evaporation.

However, he notes, scaling down chip-cooling heat pipes, which are tens of micrometers in diameter, would cause other problems, such as a leap in resistance to the flow of both liquids and gases.

At the nanoscale, the new work helps unravel drying mechanisms, comments Albert B. Frazier of the Georgia Institute of Technology in Atlanta. "Use of this knowledge could lead to smarter nanochannel designs," he says. —P. WEISS

Ant Iron Chefs

Larvae fix dinner but don't sneak snacks

N. BUCK

ROLE PLAYING Adults with large heads defend the *Pheidole spadonia* colony, and the smaller, millimeter-long workers cut up meat from prey and tend the young. The chubby, translucent larvae marinate meat in their digestive juices before the workers distribute it.

New videos of ants fixing an entrée of fruit fly stew show that it's the youngsters who do the colony's version of cooking. What's more, they don't nibble as they cook but wait to be served their fair share.

Ants prepare their meat not by heating but by marinating it with digestive enzymes to create a glistening protein slurry. With their hourglass figures, adult ants have such tiny waists that solid food can't pass through to their abdomens. Biologists already knew that the blob-shaped larvae predigest meat. Some scientists had suggested that the adults feed meat to the larvae and return later for some regurgitated protein slurry.

That's not what happened, though, in videos of lab colonies of pinhead-size *Pheidole spadonia*, says Deby Cassill of the University of South Florida St. Petersburg. Adults placed lumps of prey in little hairy depressions on top of the larvae's bellies, and for some 5 hours, larvae drooled digestive enzymes over the meat as it dissolved into a protein drink. The adults collected the slurry to distribute, but during the kitchen prep, the youngsters rarely took a swallow themselves.

The larvae "truly are performing a colony-level task, not a selfish one of eating," comments social-insect biologist Joan Herbers of Ohio State University in Columbus.

Colonies of *P. spadonia* have two worker castes: soldiers with huge jaws and smaller workers. Soldiers don't tend larvae or fix food. "Like our military, they are maintained and fed by tax dollars," says Cassill.

Coauthor Diana Wheeler of the University of Arizona in Tucson had caught local *P. spadonia* ants after their mating flights and established several colonies. Cassill selected descendants of those ants and set up observation nests containing 25 of the smaller workers and 30 of the oldest larvae. She fed the new colonies sugar water and a daily fruit fly and managed six times to videotape the food preparation.

When their daily meat arrived, adult workers discarded the fruit fly's wings within seconds. The adults carved the carcass into hunks and then tamped them into external depressions on the bulging bellies of the gourd-shaped larvae. The workers checked back frequently to slurp off liquid and shift chunks among larvae.

Cassill dyed some pieces of fruit fly with green food coloring to see when the translucent larvae swallowed food. They rarely consumed any of the slurry as they tended it, Cassill and her colleagues report in the most recent (November) issue of *Insectes Sociaux*. However, the larvae did eat protein slurry out of the mouths of adult workers.

"Larvae are a fully functioning caste," performing a job to benefit the entire colony, just as the soldiers and small workers do, says Cassill.

Ant specialist Bert Hölldobler of the University of Würzburg in Germany points out that weaver ants also use child labor. To make their elaborate leaf tents, workers manipulate larvae "like living [silk-]spinning shuttles," he says. —S. MILIUS

Mixed Message

Pheromone blend sends signal

The meaning of a chemical message released by male Asian elephants depends on the chemical's total concentration as well as the balance of the chemical's two forms, say the authors of a new report.

The pheromone frontalin, a signal well studied in bark beetles, has two versions that are molecular mirror images of each other. Previously, L. Elizabeth L. Rasmussen of the Oregon Health and Science University in Beaverton and David R. Greenwood of Hort Research in Auckland, New Zealand, reported that Asian elephants also use frontalin as a pheromone. Mature males release this chemical during musth, a period when they become aggressive and seek mates.

In their new study, Rasmussen, Greenwood, and their colleagues set out to determine which of the two forms of frontalin elicits a behavioral response. They analyzed more than 100 secretion samples from the temporal glands of six male Asian elephants. These glands are located on the sides of an animal's face, near its eyes.

The researchers found that frontalin first appears in the gland's secretions when males are in their teens. Its concentration rises 15-fold over the next 25 years, such that sexually mature, socially dominant males between the ages of 31 and 43 years secrete the largest amounts.

Furthermore, the ratio of the two mirror-image forms of frontalin varies with a male's age. Young males tend to secrete more of one form, but as they enter their 20s, they produce an increasingly balanced ratio of the two forms.

The length of time that a male remains in musth increases with age, from less than a week in young males to as long as 3 months in mature males. Secretion of the two pheromone forms was most evenly balanced during the middle period of musth in mature males.

The researchers also observed the responses of various elephants to collected secretions. Sniffing the sample, for exam-

ple, indicates attraction, while circling it suggests repulsion, the scientists say.

The team reports in the Dec. 22 *Nature* that samples from young males—containing a low concentration of frontalin, mostly in the young-elephant form—aroused mild interest from males, while females largely ignored the pheromone. Mature-male secretions—with high concentrations of frontalin in even ratio—repulsed other males and non-ovulating and pregnant females but attracted ovulating females.

"Up until now, we thought that there was only one signaling compound involved, but here we have a blend," says Rasmussen.

Glenn Prestwich of the University of Utah in Salt Lake City comments, however, that the experiment didn't tease apart the effects of concentration and of ratio. He'd like to see a behavioral test that compares samples with the same concentrations of frontalin but different ratios of the two forms. —A. CUNNINGHAM

Stem Cell Controversy

Scientist is retracting landmark finding

A South Korean scientist who claimed to have cloned the first human embryonic stem cell is now requesting that some of his published work be retracted. But as *Science News* went to press, it was still unclear whether the abrupt turnaround arose from scientific fraud, a laboratory mistake, or both.

Either way, the fiasco is a setback for stem cell research, other scientists say.

In the March 12, 2004 *Science*, Woo Suk Hwang of Seoul National University and his team reported that they had removed DNA from a human egg, replaced it with DNA from a mature cell, and then grown the altered egg into a cluster of cells. It appeared that the researchers had thus cloned human stem cells, with the potential to develop into any cell in the body (*SN: 2/14/04, p. 99*).

In May 2005, the team reported an improved process with large potential benefits (*SN: 5/21/05, p. 323*). The researchers created 11 distinct stem cell lines tailor-made to individuals. The result appeared to pave the way for customized replacement tissues.

The 2005 work, published in the June 17 *Science*, has now been called into question. Hwang and one of his U.S. coauthors, Gerald P. Schatten of the University of Pittsburgh, last week asked *Science* to retract that paper. Hwang says that there were mistakes in the 2005 report, but he hasn't specified what they are. He acknowledged that some of the stem cell lines were contaminated with yeast cells.

However, study coauthor Roh Sung Il of MizMedi Hospital in Seoul claimed in the Korean media that Hwang had told him that some of the stem cell lines described in the paper had been replaced by fakes.

The University of Pittsburgh and Seoul National University have begun investigating the cloning research.

In a press conference in Korea, Hwang denied fabricating data but said that some of the stem cells reported as cloned might have been intentionally switched with conventional stem cells. He says that he is asking police to investigate.

QUOTE

"I think this is a shame."
LEONARD I. ZON, Harvard Medical School

"I think this is a shame," says Leonard I. Zon, a stem cell researcher at Harvard Medical School in Boston. The controversy won't be cleared up until other researchers replicate the work, he says. Meanwhile, Zon says that he hopes that stem cell research will proceed.

Hwang said at the press conference that he has frozen stem cells that he can use to demonstrate that his cloning procedure works. —N. SEPPA

RECORD BREAKER Hurricane Epsilon, which formed in the central Atlantic and never threatened land, was the final named storm and the 14th hurricane of 2005.

J. SCHMALTZ/NASA GODDARD SPACE FLIGHT CENTER

Beyond the ABC's

North Atlantic posts record hurricane season

The 2005 hurricane season in the North Atlantic Ocean shattered records. According to the National Hurricane Center in Miami, 26 tropical storms this year had winds of at least 63 kilometers per hour (39 miles per hour), the point at which hurricanes are named. The previous record, from 1933, was 21 named storms. For the first time, the alphabetical list of names wasn't long enough; after Hurricane Wilma, storms were tagged with Greek letters. Each year's list has only 21 names, since it excludes those beginning with Q, U, X, Y, or Z.

Of the named tropical storms, 14 became hurricanes, a tally that smashed the previous record, set in 1969, of 12 in a season. Seven 2005 storms became category 3 hurricanes, with winds exceeding 178 km/hr (111 mph). Four of this year's hurricanes struck the U.S. mainland with category 3 strength or greater, which breaks the record of three landfalls by major hurricanes, set just last year.

For the first time since 1851, three storms in one season—Katrina, Rita, and Wilma—reached category 5 status, with winds exceeding 249 km/hr (155 mph). Wilma was the strongest storm ever recorded in the North Atlantic.

Epsilon, the last named storm of the year, achieved hurricane status 2 days after the hurricane season's traditional end on Nov. 30. —S. PERKINS

ARCHIVAL SCIENCE

Rediscovered photos provide a look inside the 1925 Scopes evolution trial

BY IVARS PETERSON

The July afternoon was oppressively hot in Dayton, Tenn. After a steamy morning session in the county courthouse, the judge had ordered that the trial of teacher John T. Scopes be moved outdoors. As the afternoon wore on, more and more townspeople joined the crowd, which eventually numbered at least several hundred. It was the final day before the case was to go to the jury, and, in a calculated move, lead defense attorney Clarence Darrow, 68, called William Jennings Bryan, a member of the prosecution team, to testify for the defense. A famed orator and 3 years younger than Darrow, Bryan was the leader of a fundamentalist campaign against the teaching of human evolution in schools. In dappled shade, Bryan sat in a chair as Darrow stood nearby, firing question after question at the witness. It would become one of the most famous scenes in U.S. legal history. Bryan himself fell ill and died just 6 days later.

As the 2-hour interrogation proceeded, a photographer captured the scene: Bryan's face as he did his best to answer a question and Darrow as he waited to pounce, thumbs pulling casually on his suspenders. The photographer's name was Watson Davis, managing editor of Science Service (the publisher of what is now *Science News*). Davis was one of two Science Service reporters covering the 10-day 1925 trial and writing articles for distribution to newspapers around the country.

A photo buff, Davis had brought along his camera to record not only such climactic moments but also the people and locations related to the trial. However, the dozens of photos were never published. First in a file at Science Service's offices and later tucked into a box at the Smithsonian Institution Archives in Washington, D.C., the negatives remained forgotten until they were recently found by independent historian Marcel C. LaFollette, who lives in Washington.

"These stunning photographs are the discovery of a lifetime," LaFollette says. She is now writing a book about the Scopes trial, focusing on the photographs that she uncovered.

LaFollette's "incredible find is a wonderful example of how hard it is to predict what the value of an archive will be," says science historian Bruce Lewenstein of Cornell University, "and why more science-oriented organizations should put effort into preserving their records."

HOT SEAT — On July 25, 1925, defense attorney Clarence Darrow (standing right of center) interrogated William Jennings Bryan (in bow tie and seated at left), a member of the prosecution team, at the trial of John T. Scopes in Dayton, Tenn. Scopes was accused of breaking the state law against teaching evolution in public schools. The photo, recently uncovered in the Smithsonian Archives, was taken by Watson Davis, managing editor of Science Service from 1921 to 1928, when he became acting director.

DAVIS/SCIENCE SERVICE © SMITHSONIAN INSTITUTION

HUGE COLLECTION The box containing the Scopes-trial negatives was one of several hundred holding photos, correspondence, and many other Science Service records.

Founded in 1921 as a not-for-profit organization, Science Service aimed to increase and improve the public dissemination of scientific and technical information. Initially, it was a daily news service offering articles to client newspapers. The bulk of these stories was combined weekly into magazine form as the *Science News-Letter*, which was available to subscribers.

The organization later expanded into microfilm, movies, and offerings for magazines and radio. It also began various educational programs, ranging from the Science Clubs of America and "Things of Science" activity kits to the Westinghouse (now Intel) Science Talent Search.

In 1971, Science Service donated its records, up to the year 1965, to the Smithsonian. The collection was so large, however, that the Smithsonian didn't have the resources to sort, integrate, and index the records. "For a very long time, just a cursory inventory was available," says Tammy Peters, supervisory archivist at the Smithsonian Archives.

Nonetheless, in the mid-1970s, the materials were a valuable resource for David Rhees, then a student at the University of North Carolina at

IN THE BEGINNING — This photo of downtown Dayton, Tenn. (above) includes F.E. Robinson's Drugstore (sign visible center right), where a group of business leaders met and decided to challenge Tennessee's new statute against teaching evolution. Shortly after the Scopes trial ended, Watson Davis (right) embarked on his first trip to Europe, where this photo of him was taken in 1925.

Chapel Hill and now director of the Bakken Library and Museum of Electricity in Life in Minneapolis. For his 1979 master's thesis, Rhees examined the first decade of Science Service's existence.

"Part of the great fun of my project was reading through a decade's worth of issues of the *Science News Bulletin* and *Science News-Letter*," Rhees says. "You could really capture the excitement of science in the Roaring '20s through those pages, and since Science Service had a board of trustees of very distinguished scientists, its reporters had access to all the leaders of the scientific profession."

In delving into the collection, Rhees was most thrilled to discover a telegram that reporter Frank Thone had sent directly from the Scopes trial to Edwin Slosson, who then headed Science Service. Both Thone and Davis filed daily reports from Dayton for the duration of the trial.

"The Scopes trial was one of the biggest science stories of the twentieth century, and the telegram, in its clipped, well, telegraphic style, connected me to the excitement and immediacy of this earth-shaking story," Rhees says.

In 1994, former Science Service staff member Jane Livermore volunteered to start cataloging and sorting the collection. LaFollette helped complete that task, developing an annotated and illustrated contents list of all the boxes. The list, called a finding aid, is now available online at *http://www.siarchives.si.edu/research/scienceservice.html*.

"There is wonderful material on censorship in World War II, extraordinary material on the development of physics, papers related to the early history of the National Association of Science Writers, and much more," LaFollette says, adding that it's all relevant to the history of science communication.

Says Peters, "LaFollette helped us see the collection's significance. You can look at the collection from many different angles. It tells you what was happening in science and what was happening around the world. You can check for any topic in science and see how it was handled."

DATELINE DAYTON The Scopes trial was important to Science Service financially. Newspapers paid for articles from the trial, and these funds helped support the struggling organization.

Science Service also played a role behind the scenes, aiding Darrow's defense team. The Science Service staff helped coordinate the gathering of scientific experts on evolution to testify at the trial. It also distributed a series of articles, written by prominent scientists, explaining and defending evolution.

Davis made two trips to Dayton. In June, before the trial started, he made a detour to Dayton as part of a previously planned trip west. He took one set of photos during this visit, including pictures of Scopes himself and various places, such as the school where Scopes taught and the drugstore where a group of Dayton civic leaders had met and decided to challenge Tennessee's new statute against teaching evolution.

Davis returned to Dayton in July, accompanied by Thone, for the full 10 days of the trial. The two reporters wrote daily reports about the trial for various clients. "They made enough from their wire service clients to cover their expenses," LaFollette says. "Producing news that [Science Service] could sell was always the crucial thing in those first 20 years."

As well as reporting, Davis took additional photos during the trial, including several of the confrontation between Darrow and Bryan on the second-to-last day. By that time, many reporters had already left town, anticipating that nothing much more would happen.

"Davis was a sort of friend of the defense team, so he was sitting or standing near the defense team," LaFollette says. This

vantage point gave the reporter-advocate and his camera a clear view of Bryan's face.

"The pictures from the Science Service archive shed light on how a hotly debated trial was literally hot—so hot it had to be held outdoors," Lewenstein says. "We see how close everyone had to sit as they struggled with deep intellectual, religious, and political ideas."

Scopes was convicted and fined, but the verdict was eventually overturned on a technicality. Shortly after the trial ended, *Science News-Letter* published an appeal for a scholarship fund so that Scopes could attend graduate school. Scopes chose to study geology at the University of Chicago and later worked in the oil industry.

TREND SETTER — John T. Scopes (left) in June 1925, just weeks before his historic trial for teaching evolution. Scopes, 25, was in his first job after graduating from the University of Kentucky. He taught algebra and physics, coached football, and occasionally was a substitute biology teacher. For teaching about evolution, he went on trial at the Rhea County Courthouse (right) in Dayton, Tenn., in June 1925.

DAVIS/SCIENCE SERVICE © SMITHSONIAN INSTITUTION

HIDDEN TREASURES The extensive correspondence and the many photos in the Science Service collection may provide important insights into the creation of a public image for science and scientists. "The records tell a historian how science news was constructed," LaFollette says. "They also often reveal a great deal about the construction of science itself and the interactions between scientists."

"In Science Service," she adds, "we can now see that the organization, in its first 20 years, was much more crucial for the development of science popularization than historians had believed before."

LaFollette is also writing a book about radio broadcasts popularizing science, including the *Adventures in Science* series produced by Science Service from 1935 until the 1950s.

Last summer, Smithsonian intern Mary Tressider, a student at Mount Holyoke College in South Hadley, Mass., created an online exhibit highlighting the important, pioneering roles that women played as reporters for Science Service (*http://siarchives.si.edu/research/sciservwomen.html*).

Historian Sevan Terzian of the University of Florida in Gainesville is now delving into the Science Service archive to look at the organization's role in science education, particularly after-school activities such as science clubs and fairs.

"The collection has proved to be exceptionally useful," Terzian says. "I have ... found radio-program transcripts, correspondence, brochures, pamphlets, and press releases by Science Service from the 1930s to the 1950s."

"What else might come from the Science Service archives?" Lewenstein asks. "Who knows? That's part of the fun of being a historian." ■

SQUIRT ALERT

A tiny marine alien is emerging as a coastal grinch

BY JANET RALOFF

As scientific adviser to a group of Maine watermen, ecologist Larry Harris had heard his share of stories. But one tale, told to him 2 years ago, proved unforgettable. A fisherman related how he had been hauling up a dredge used to scout for scallops in nearby Cobscook Bay when he snagged something novel: a life form resembling blobs of pancake batter.

In all his decades at sea, the man said, he'd never encountered anything like it. His girlfriend, riding along at the time, told the man not to touch the pearly-white, gelatinous glob draping over rocks and shells that the dredge had brought up. The stuff looked like it might have come from outer space, she said.

It was an alien, all right, but one of Earthly origins.

From the waterman's description, Harris recognized the globs as parts of a mat of sea squirts—soft-bodied animals that scientists refer to as tunicates, for the tunic-resembling sheath covering each individual. This was a colonial tunicate consisting of thousands of 2-millimeter-tall individuals fused side to side.

Harris was also fairly certain that the Cobscook encounter signaled bad news: arrival of what he calls "the tunicate from hell." This devilish species' behavior is a biologist's "worst nightmare," says Harris, who's based at the University of New Hampshire in Durham. This sea squirt reproduces rapidly by several means, has no known predator, and grows over and smothers any plant or animal that doesn't make way.

Last August, Harris was among scientists looking for alien species in Cobscook Bay, one of Maine's important fishing grounds. At his prompting, the team's search included the area from which the fisherman had hauled up the sea squirt mats. Sure enough, the bottom there was riddled with patches of this animal that researchers are confident isn't a native.

Over the past few years, the smothering mats have turned up in coastal waters as distant as those off western Canada, New Zealand, and Holland. In most of these newfound invasions, patchy mats occur within only small areas, perhaps a tidal pool or a few hectares of a bay.

WHITLATCH

MAKE WAY — The peachy-beige amorphous sheets—highly acidic mats of the invasive sea squirt *Didemnum*—spread like pancake batter over rocks and any living thing in their path. For scale, white disk at bottom is 2 millimeters in diameter.

No one knows where the organisms came from, but biologists agree that they belong to the genus *Didemnum* and are spreading quickly in nontropical northern and southern latitudes.

This is a new breed of alien. It's moving into offshore ocean waters previously thought immune from such invasions. The presumption before *Didemnum* was that anything that could live in harsh, open-ocean conditions had established itself there so long ago that it could now be considered a native.

Biologists haven't determined the squirt's species or environmental requirements, but they're rushing to identify some vulnerability that might be exploited to check its explosive spread.

It's already too late to think of eradicating this ocean invader, says James T. Carlton, director of maritime studies at Williams College & Mystic Seaport in Connecticut. "When a species like this sea squirt becomes so abundant, it's no longer retrievable," he says. At this point, the goal can only be to cope with existing populations and slow their takeover of neighboring territories.

DESIGNED TO SURVIVE Some 3,000 species of squirts inhabit waters from the equator to the poles. For most of Gretchen Lambert's 40 years spent studying these animals, "I was kind of like the Maytag repairman," she says. "Nobody ever called."

Squirts were a little-valued detail in the seas' vast diversity of inhabitants, explains the taxonomist, who is affiliated with the University of Washington's Friday Harbor Laboratories in Seattle. Demand for her expertise rose precipitously a dozen or so years ago, she says, when an unremitting tide of nonnative marine species began upsetting the balance of established ecosystems in near-coast waters around the world. Some of the more unusual pests were foreign squirts.

"Now, I spend virtually all of my time on invasive species," she says—particularly on that "very interesting scourge" known as *Didemnum* sp.

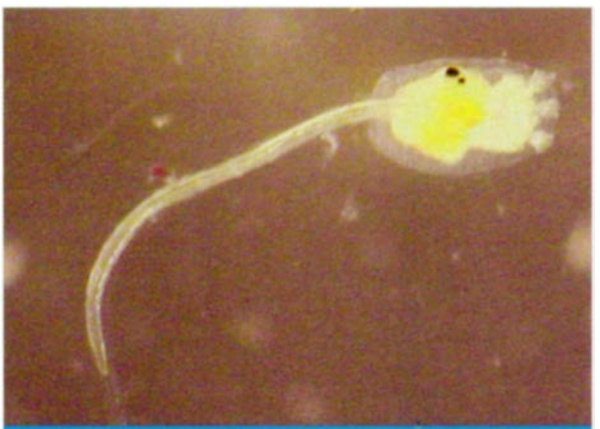
Like other sea squirts, this one begins life as a tadpolelike larva with eyes, a gut, a heart, and a primitive, backbonelike notochord. Once a sea squirt larva finds a suitable surface, it bonds to it. At that point, the larva metamorphoses into a barrel-shaped animal with a cover—its tunic—that's strengthened by hard clumps of cellulose. Squirts are the only animals to make cellulose, a primary structural component of plants.

The animals take their name from their two siphons at or near

the top of the barrel. One draws in water laden with food—bacteria, algae, and other goodies—and squirts it into a filter basket lined with a sticky mucus. The critter then squirts out the water via the other siphon.

Most squirts are solitary animals, and some can grow several inches high and a few inches in diameter. Among the *Didemnums*, each individual, or zooid, is tiny, but it's usually part of large population. These colonies expand by budding new zooid clones from their edges.

The *Didemnum* in U.S. waters is like a squirt on steroids, notes Robert B. Whitlatch of the University of Connecticut in Groton. This "beast," as he refers to it, grows several times faster than any other sea squirt known. Within a few seasons, a single zooid can clone itself into a mat that's a meter in diameter. The zooids can also reproduce sexually, and each summer spew larvae into the water to establish distant colonies.



SPAWN — To seed distant colonies, *Didemnum* mats periodically release these 1-millimeter-long, tadpolelike larvae all summer.

In colors ranging from white to peach, *Didemnum* mats have the slick feel and compressibility of cured silicone caulking, Whitlatch says. A colony's surface is acidic as is that of others of its genus—presumably, to make it unappetizing to potential predators. However, Whitlatch notes, "with a pH of 2, equivalent to stomach acid," the invasive species' coating is more acidic than that of its cousins.

How long can each animal live? "We don't know," Lambert says, "but theoretically, it could be immortal" because it can continue to clone.

ORPHANS NO MORE No one knows precisely when *Didemnum* sp. moved into North American waters. But as many as 25 years ago, people around the Damariscotta River estuary in Maine described something resembling the rubbery mats. Lambert recently examined a preserved, 11-year-old specimen from the estuary. She concluded that Maine's invader is the same sea squirt now spreading in Massachusetts waters.

Lambert has spent most of the past 5 years trying to assign the invasive squirt in U.S. waters to some previously known species, but neither she nor other researchers have found a match. "I finally ended up calling it 'sp' for species to indicate I don't know what it is," Lambert concedes.

What she can say is that it looks exactly like the invasive squirt that emerged in waters off New Zealand in late 2000, near British Columbia 2 years ago, and off Washington State last year.

Page Valentine of the U.S. Geological Survey in Woods Hole, Mass., maintains a Web site devoted to mapping suspected *Didemnum* sp. colonies. He says that the mats emerged in coastal waters of the Netherlands and California in the early 1990s and at French coastal sites this past summer.

The animals in all those colonies appear to be the same as a *Didemnum* reported by Japanese scientists. If confirmed, Valentine says, this may point to an Asian origin. Texts from the 1920s describe such a colonial squirt in waters near Japan. Lambert is seeking samples of Japan's *Didemnum* for DNA fingerprinting and comparison with the U.S. invader and colonies elsewhere.

Asian origins for this species would be consistent with the leading theory of the squirt's introduction to U.S. coastal waters: that the tunicate hitchhiked on oysters imported from Japan into New England, 30 years ago, to serve as seed stock for aquaculture operations.

Whatever its source, the squirt certainly made itself at home. Three years ago, Valentine spotted *Didemnum* mats on the floor of Georges Bank, 240 kilometers east of Cape Cod. Perplexed as to what it was, he sought the help of Lambert and Mary R. Carman of the Woods Hole Oceanographic Institution. From them, he learned that what appeared to be the same squirt was overtaking tidal pools in his own backyard, Woods Hole.

In 2004, Valentine went back to Georges Bank, one of the Northeast's primary finfish and shellfish grounds. He found that *Didemnum* sp. was by that time blanketing 100 square kilometers of seafloor. By last summer, Valentine reports, that patch had grown to 175 km^2. He also found *Didemnum* spreading over another, 70-km^2 patch of seafloor.

These sightings are troubling, Carlton says, because Georges Bank's 40-to-60-meter-deep water is open ocean. He told *Science News*, "Prior to this *Didemnum* showing up there, I would have said there was no clear example of nonnative species in our offshore waters, despite nearly 500 years of steady shipping from Europe and more than 200 years of shipping from elsewhere."

NOVEL BEHAVIOR Connecticut researchers have been studying *Didemnum*'s invasion of Long Island Sound, where the squirt almost completely covers 2.5 km^2 of the seafloor at a depth of 30 m. That alone is unusual, Whitlatch notes, "because sea squirts that we regularly have in this area rarely grow along the bottom." They prefer instead to live on pilings, floating docks, buoys, and the bottoms of boats.

Didemnum sp. grows on such marina features, too, and on any hard surface—from plastic to gravel—at apparently any depth. Whitlatch has seen it overgrow sponges, sedentary shellfish, and even sea grasses. The only surfaces it avoids are mud and sand; the only neighbors it respectfully sidesteps are stinging corals and anemones.

The Connecticut scientists worry about the squirt's ecological repercussions. Besides smothering sponges and shellfish, it can bury the small worms, shrimp, and other seafloor animals that nourish fish. There is even concern that *Didemnum* may make U.S. waters inhospitable to prized, young lobsters.

To better understand the invader, Whitlatch's team has begun rearing it in the lab. These studies have revealed still more novelties.

For instance, most squirts grow faster in the warmest waters in their temperature range. However, within the range that *Didemnum* sp. prefers, it grows faster in cooler water. Therefore, New Jersey may be the farthest south that this squirt will invade along the East Coast, says Whitlatch, but Canada's so-far-untouched Maritime Provinces are at grave risk. They're just north of Cobscook Bay and have a similar environment.

Although the lack of any apparent predator suggests that mats of *Didemnum* sp. are well defended, Whitlatch wondered whether young, solo zooids of the species might be vulnerable. So, in the lab, he induced mats of the *Didemnum* to spawn and then introduced crabs and certain fish renowned for dining on squirts. He now reports, "We have yet to find anything that will eat even these small *Didemnum*."

Another troubling lab observation: When it ran out of real estate, *Didemnum* sp. didn't stop growing, as other squirts do.

In a glass tank fed by running water, the *Didemnum* mat covered the bottom, then grew up a wall. When that, too, was covered, the mat extended onto the underside of the water surface, suspended from a thin layer of bubbles. The colony apparently "used those bubbles as a flotation mechanism. How bizarre," Whitlatch says.

On docks and pilings, he and others have observed *Didemnum* sp. developing pendulous tendrils of clones—another feature

S. BULLARD, UNIV. OF HARTFORD

unique to this squirt. Whitlatch surmises that these lobes expand the mat's surface area to permit further growth.

What's more, the tendrils can break off under intense wave action. "We've seen these [broken pieces] roll on the seafloor, like a tumbleweed," he says. Once they settle, they can attach to something hard and resume growth.

"We now feel this fragmentation may be more important than larvae for long-range dispersal," Whitlatch says.

ANY WHICH WAY — Squirts typically anchor themselves to a rock, pier, or boat hull. However, in the lab, this invader has grown across the floor of an aquarium, up its walls, and then onto the underside of bubbles on the water's surface.

WHITLATCH

LOOKING FOR CONTROLS At Woods Hole, Carman and Valentine have been testing strategies for controlling the Didemnum's growth, especially where it threatens shellfish aquaculture. Growers of clams, mussels, and oysters, for example, typically raise their broods in bags, cages, or nets. Didemnum mats can encrust the bags and even get into the cages and nets to coat individual bivalves.

Carman reasoned that since shellfish can survive exposure to air for up to a day, but *Didemnums* can't, "it might be possible to just lift the shellfish out of the water periodically to kill the squirts." She and Valentine have just begun field tests to determine how long it takes to dry out the *Didemnum* and to identify the extent to which the timing is affected by air temperature, sunlight intensity, and humidity.

Ultimately, Carlton says, that's just palliative. It doesn't block the infection of new sites. Although most imports of seed stock for shellfish aquaculture today come from farms certified to be free of pest organisms, people have been known to illegally obtain adult oysters and clams from uncertified beds, he says. If the shellfish were to come from an area infected with *Didemnum* sp., it could spread the colonies, says Carlton.

"There's almost no way to regulate something being transported in the tarp-covered back of a pickup truck," he notes.

At least some *Didemnum* immigrants could have arrived in the ballast water of a ship or in a hull compartment storing an anchor and its chain. "Below the waterline, [that compartment] is always full of water and poses a fantastic refuge" for alien plants and animals, Lambert notes. One study under way in New Zealand, she says, has already found sea squirts, fish, crabs and many other creatures hitchhiking in this largely ignored closet aboard oceangoing vessels.

Finally, ships trawling seafloors that host the invasive squirt or berthed in infected ports might pick *Didemnum* up on their gear or hulls and carry it to new sites. Indeed, trawling might prove a major boon to the species' dispersal, Lambert notes, since any fragment broken from a mat can establish a new colony.

This scenario reinforces the need for early action to prevent the spread of alien species. Carlton says that the *Didemnum* invasion is proving that "once out, there's no putting the toothpaste back in the tube." ■

IRREPLACEABLE PERPLEXITY 101

Ms. Cleary has designs on teaching evolution

BY BRUCE BOWER

Hello class. Settle down please, it's time for today's lesson. Put that iPod away, Wesley, or Ms. Cleary will take it home with her and you won't hear Green Day for a blue moon. Melinda, that chirpy ring tone from your cell phone must stop, or Ms. Cleary will use the infernal device to call her cousin Bernie in Barcelona. Your father will emit his own ring tone when he receives your next phone bill.

Now that your attention is riveted on Ms. Cleary, let's focus on today's special topic. It has come to Ms. Cleary's attention that evolution is in the news. Evolution is really happening, as you kids say.

People with inquiring minds in Kansas and Pennsylvania and, well, all sorts of places now question whether life really evolved on this planet as proposed by Charles Darwin and his scientific followers. They want children like you to learn about intelligent design, an all-purpose evolution substitute.

Ms. Cleary suspects that those few of you who still read newspapers or at least glance at *Headline News* while channel surfing over to the latest WB teen soap opera have heard about this biological brouhaha. Today, Ms. Cleary will answer your questions about the great evolution debate in her capacity as a humble servant of youth.

You may begin.

What's evolution?

Bless you, you've actually been listening, Wesley. Miracles do occur. Class, be warned that you may hear Hollywood actors say of a director, "Oh, he's so evolved" or speak of an award-winning colleague as "having evolved to a new level." These people don't know evolution from an audition for *Scream: Part 8*.

Over long periods of time and many generations, animals change their forms. Form changes that serendipitously help animals survive tend to last. However, environments change, too, and by so doing, sometimes wipe out groups of animals that busted their tails to evolve in a previous setting. That's cold. That's evolution.

All the animals now living on this planet trace their ancestries back billions of years through a variety of creatures that no longer exist, including—at the very beginning—one-celled organisms unlike any that you may happen to run across today. This biological unity and diversity go together like The Captain and Tennille, like marble-fudge ice cream and cellulite, like a Quentin Tarantino movie and the sensation of popcorn chunks rising in your throat. That's cool. That's evolution.

Old-school evolution often occurs too slowly for an observer to see. That's inconvenient for those who limit reality to anything that can be captured on their digital video cameras. For those interested in seeing for themselves, ponder artificial evolution. Consider, for example, dog breeding over the past century or Michael Jackson's face over the past 25 years.

What's a missing link?

A missing link, Viola, makes Ms. Cleary's charm bracelet pinch her wrist. Although the intelligent-design people put a lot of stock in missing links, those wacky creatures tell you squat about evolution. So what if we never stumble over the remains of, say, the last common ancestor of apes and people?

Let's consider primates, class. The worldwide collection of fossil skulls from ape and human ancestors shows shape changes that occurred over vast stretches of time among related creatures. Was there ever a half-person, half-chimp? That brings a repulsive and unsanitary image to mind.

Since nobody knows what the common ancestor looked like, scientists in their prickly way may never agree that they've found it. Many questions remain about the ways in which fundamental shape changes arise and foster the evolution of new types of animals. These aren't signs that evolution never happened. They're signs that fascinating turns in evolutionary biology lie ahead for the intellectually curious. By that turn of phrase I mean anyone willing to put down *People* magazine long enough to read a few books—even paperbacks.

What is intelligent design?

It's the missing link between creationism and religious instruction masquerading as biology. Yes, class, Ms. Cleary sees a place for missing links after all, and it's not pretty.

Creationism takes a literal view of the Bible, so it holds that the Earth and all its creatures were created in one fell, divine swoop 6,000 years ago. Fair enough, but that's a hard sell as must-have information in a sophomore biology course.

Enter intelligent design (ID), an idea that tries to make creationism palatable to adults on school boards who have no scientific training or interests but have the power to tell adults who do have scientific training and interests how to teach science.

Ms. Cleary admits to having a hard time finding anything substantial in the writings of those whom she refers to as IDologues. Much arm waving concerns the concept of "irreducible complexity." Listen closely, class: Biological cells contain protein-making systems for basic functions, such as clotting blood. IDologues assert that such systems are irreducible, consisting of many parts that work together so closely that the whole operation shuts down if a single component goes missing. So, evolution couldn't make adjustments part by part.

IDologues also claim that these biological entities are so complex that they must have been designed from the start to work as they do now rather than having evolved from previous forms.

Essential biological systems must therefore reflect a designer's dexterous hidden hand, not evolution. And perhaps nonessential biological facts of life, such as irritable bowel syndrome and male-pattern baldness, reflect the cold, hard slap of a designer's hand.

Ms. Cleary assigns this argument a grade of F for "forget it." As physicist Mark Perakh of California State University, Fullerton has pointed out, if the loss of a single part destroys a system's function, then that system has been poorly designed. Any well-designed system contains features that not only perform their regular roles but can compensate for losses or malfunctions elsewhere. Indeed, scientists are finding that biological systems exhibit just this kind of resiliency and complexity. Biology is messier and more adaptive than IDologues imagine.

Evolution is just a theory, right? Shouldn't we learn about alternatives to it?

A scientific theory is a wonderful thing, Melinda. It's not a wild guess or a poor substitute for facts. It's a framework for making sense of a large number of related observations about the world. Scientists use theories to guide them in designing their experiments. Depending on what the scientists find, a theory can crash and burn or take on unexpected powers of explanation. In other words, theories evolve, and evolutionary theory has gotten stronger over the years.

Don't misunderstand Ms. Cleary. She has great respect for religion, as you all know. Religions evolve and adapt too. But religions answer big questions that nearly everyone asks about our connection to the universe and the meaning of our lives. Science generates novel questions about us and the world that almost nobody would have thought to ask otherwise. Science sifts nuggets of insight out of humanity's irreplaceable perplexity and then subjects that knowledge to continuing scrutiny. Ms. Cleary would refer to irreplaceable perplexity as IP, but that sounds vaguely repellent to her.

By the way, there's plenty of genuine controversy for students of evolution to learn about. Unfortunately, it's not often taught to them, even in the most scientifically tolerant classrooms.

The controversy concerns not whether evolution exists but how it works. As anyone who has attended a meeting of anthropologists can tell you, these scientists engage in epic battles about the nature of evolution. They make Tony Soprano look like a flower child. You'll hear these highly educated people trade streetwise yet erudite barbs such as "Hey fossil breath, people today evolved from a direct ancestor in Africa around 200,000 years ago at most," and "So sorry, matrix for brains, but people evolved simultaneously from populations in Africa, Asia, and Europe over at least the past 1 million years."

Ms. Cleary has tidied up the scientists' actual insults so that impressionable young minds won't be startled.

What is evo devo?

To the best of Ms. Cleary's recollection, that's a cover band inspired by a strange 1980s pop group that wore funky flower pots on their heads and danced like geeky robots, singing "Whip it! Whip it good!"

Isn't evo devo short for evolutionary developmental biology?

Oh yes, thank you, Todd. Ahem. Sometimes Ms. Cleary has flashbacks to her wayward youth.

Evo devo, the study of how changes in genes and individual development contribute to evolution, has advanced greatly in the past 20 years. It's now known that many different animals—from flies to people to elephants—share a set of genes that governs the formation of their bodies and body parts. As scientists are learning how complex animals are constructed from single cells, they're discovering that subtle tweaks to body-building genes promote the descent and modification of animals, no steroids required. Such findings promise to expose the inner workings of evolutionary processes originally proposed by Darwin.

The development of individual organisms out of tiny cells is an amazing thing, class. Physical development is as flexible as one of those charming balloon giraffes that Ms. Cleary buys at the state fair each year. The structures that are built by development may suffer when damaged or when parts of them are removed. But flexible developmental processes, not their end products, may well lie at the heart of evolution.

Let's contemplate the human brain for a moment, class. A child who has half of his or her brain surgically removed to treat severe epilepsy will still grow up to display virtually all the mental and physical faculties of a child with a whole brain. Massive cell reorganization that occurs in the developing half-brain picks up the slack. Brain development is irrepressible, not irreducible.

Did you hear Ms. Cleary, Wesley? Kids with half a brain can succeed. Keep your chin up.

Is it time for lunch yet?

Maintain your focus, Melinda. Goodness knows, it must be hard to think without a wafer-size digital-communications system pressed against your ear.

Ms. Cleary expects that all of you have listened carefully to her little discourse on the evolution wars, although she will not administer a pop quiz next week.

In fact, she will not raise this topic again. After all, this is a Sunday school class. Ms. Cleary simply couldn't resist doing a little evolutionary preaching today. Don't be mad. She's just teaching the controversy. ■

DEAN MACADAM

OF NOTE

TECHNOLOGY

Nanotubes spring eternal

Forests of carbon nanotubes have acted as brushes, electron emitters, light-absorbing antennae, and even as glue mimicking the sticky fibers under geckos' feet. Now, researchers say such arrays of tiny carbon tubes are something else again—an amazing new kind of foam.

After growing thumbnail-size forests of nanotubes up to 2 millimeters tall, Pulickel M. Ajayan of Rensselaer Polytechnic Institute in Troy, N.Y., and his colleagues used a standard testing instrument to repeatedly apply and release vertical pressure.

For the first few hundred compressions, nanotube arrays that were flattened to 15 percent of their original heights rebounded fully. Subsequently, the recovery was always more than 80 percent of full height, even after 10,000 cycles.

RESILIENT RIPPLES An electron micrograph shows how aligned carbon nanotubes buckle at their bases after 1,000 compression cycles. Above this region (not shown) the tubes remain straight.

Because the springy arrays are 87 percent air, the researchers liken them to foam. Each 40-nanometer-wide, multiwalled tube is so strong that flattening the foam requires hundreds of times more pressure than needed to squeeze ordinary foams, the team reports in the Nov. 25 *Science*.

The arrays may ultimately absorb impacts and vibrations in micromachinery or, perhaps, even in human joints, Ajayan says. If the nanotube forests can be grown a lot larger, they might someday compete with conventional foams, such as packing and acoustic foams, he adds. —P.W.

ASTRONOMY

A puny way to make planets

Brown dwarfs are failures in the star-making business, but they appear to be successes in the planet-making arena.

Astronomers have had evidence for several years that brown dwarfs—objects too heavy to be planets but too small to shine as stars do—are sometimes surrounded by swirling disks of gas and dust (*SN: 2/5/05, p. 83*). Similar disks that swaddle young stars are known to spawn planets.

Whether the material surrounding brown dwarfs could coalesce into planets had remained unclear. "We did not know, for example, if these disks are dense enough to allow the coagulation of dust grains or to allow any other [planet-making] process taking place," notes Dániel Apai of the University of Arizona in Tucson.

Now, infrared observations reveal that five of six brown-dwarf disks examined by the Spitzer Space Telescope are in the early stages of planet making. The telescope detected microscopic clumps of dust grains and tiny crystals orbiting the brown dwarfs. Spectra taken by Spitzer also indicate that the dust grains have settled toward the middle layer of each disk, another hallmark of planet-forming disks.

Apai and his colleagues describe their discoveries in the Nov. 4 *Science*.

The findings, Apai says, "emphasize the possibility to have planetary systems around brown dwarfs, which are among our closest neighbors." These failed stars may also be more common than bona fide stars, upping the chances of finding many more planets beyond our solar system. —R.C.

BIOMEDICINE

Ebola may travel on the wing

Researchers combing the forests of Central Africa have found evidence that fruit bats can carry the Ebola virus, a report in the Dec. 1 *Nature* reveals.

Ebola causes an often deadly hemorrhagic fever in people, but how the virus spreads from place to place and between species has perplexed scientists since human infections were first identified in 1976 in Zaire.

Using nets, the scientists trapped 679 bats and 222 birds, along with 129 rodents and other small ground animals, in an area spanning parts of Gabon and the Republic of Congo. The researchers chose the area because local people there had found gorilla and chimpanzee carcasses infected with Ebola.

Analysis showed that 16 of the bats had antibodies against Ebola virus, and 13 others had Ebola-virus RNA in their livers or spleens, reports virologist Eric M. Leroy of the Centre International de Recherches Médicales de Franceville in Gabon. None of the birds or ground animals was infected, Leroy says.

Curiously, the bats were all healthy. Leroy notes that the natural ranges of the bats found to be infected overlap the sites of past Ebola outbreaks in people. Bats being killed and prepared for food could infect people during handling, Leroy says.

Human contact with infected apes has also been linked to Ebola outbreaks (*SN: 2/5/05, p. 84*), and Leroy hypothesizes that fruit bats may spread the virus among gorillas and chimps when the animals compete for food during the dry season.

Education programs warning people against handling or eating meat from both bats and apes might limit Ebola's spread, the authors note. —N.S.

EARTH SCIENCE

Lab tests hint at where xenon hides out

New experiments conducted at high temperatures and pressures may explain the puzzlingly low concentration of xenon gas in the atmosphere.

Under conditions normally found at Earth's surface, atoms of xenon don't bond with other atoms, a trait common to the other elements known as inert gases, including neon, argon, and krypton.

But atmospheric concentrations of the gas on Mars and Earth are one-twentieth of what would be the expected values from its abundance in the universe, says Chrystèle Sanloup, a geophysicist at Pierre and Marie Curie University in Paris. Now, she and her colleagues may know why.

The researchers heated capsules filled with xenon and powdered quartz to a temperature of 2,000°C and squeezed them at up to 50,000 times atmospheric pressure at sea level, mimicking conditions many kilometers below Earth's surface. Passing high-energy X rays through the samples revealed that xenon had dissolved into the quartz, says Sanloup. Some of the xenon atoms had even bonded with oxygen in the quartz's crystalline structure, she notes. The other inert gases don't form such bonds and fully escape to the atmosphere when pressure is released.

If such xenon storage takes place in the abundant silicate minerals found in the crusts of Earth and Mars, it could explain the dearth of that gas in the planets' atmospheres, the researchers say in the Nov. 18 *Science*. —S.P.

A. CAO ET AL./SCIENCE

NEW TARGETS

Molecule marks leukemia cells

Researchers can now tag individual malignant cells in the bone marrow of patients with acute myeloid leukemia. Using an antibody that latches on to a newfound marker on the surface of the cancerous cells, the scientists can assess the cells' abundance following chemotherapy and predict how well each patient will fare.

Gerrit Jan Schuurhuis of the Free University Medical Center in Amsterdam and his colleagues recently identified the new marker, called C-type lectin-like molecule-1 or CLL-1, in 92 percent of people with a form of acute myeloid leukemia. It appears only on the type of bone-marrow cell that goes awry in that disease.

The researchers used their new technique to measure CLL-1 in the marrow of 89 patients whose leukemia was in remission. The molecule's abundance correlated with a patient's odds of later relapsing.

"These molecules may be not only a means to identify but also to target and destroy" malignant cells, comments James N. George of the University of Oklahoma Health Sciences Center in Oklahoma City. —B.H.

STEM CELLS

Rare marrow cells tackle deadly immune reaction

Blood-making stem cells taken from a healthy person's bone marrow can give patients a fighting chance against aggressive blood cancers, but the treatment may also attack the patient's tissues.

In an attempt to counter this usually lethal complication, known as graft-versus-host disease (GvHD), Katarina LeBlanc of the Karolinska Institute in Stockholm and her colleagues transfused a second kind of marrow-derived cell into 16 patients with GvHD. These cells, known as mesenchymal stem cells, normally give rise to bone, cartilage, and fat cells, but "they also have an ability to turn the immune system off, to dampen inflammation," LeBlanc says.

Two people died before the treatment could be evaluated. Of the rest, six recovered from GvHD and four improved.

To prepare each patient's treatment, the European team extracted a few of the rare cells from the marrow of a healthy and genetically similar person, such as a sibling. The researchers then cultivated the cells in the lab for about a month, until they had about 1 million cells per patient.

Mesenchymal stem cells might be useful in treating autoimmune diseases as well as GvHD, adds LeBlanc. —B.H.

DRUG DISCOVERY

Old drug, new trick

A team of researchers has plucked the first fruit of what the group's leader calls a "new approach to drug discovery." Scott A. Armstrong of Children's Hospital and the Dana-Farber Cancer Institute in Boston and his colleagues found that the drug rapamycin, in combination with standard chemotherapy for acute lymphoblastic leukemia (ALL), can kill chemotherapy-resistant cells.

Rapamycin is used to prevent rejection in transplant recipients. ALL is often treated with the steroid prednisone, but it's sometimes resistant to that medicine.

Armstrong's team found that rapamycin decreases the activity of a key gene in steroid-resistant cells, making them susceptible to treatment.

The tip that rapamycin might work came from Todd R. Golub and his colleagues at the Broad Institute in Boston. Golub's group is developing a database of how each Food and Drug Administration–approved drug affects the activity, or expression, of about 22,000 human genes.

Researchers already know how gene expression changes in many forms of cancer. By comparing the information on a particular cancer with the gene-expression effects of the entire medical armamentarium, they can potentially identify new therapeutic pairings, Armstrong says.

The concept, he says, is to "let the tumors and drugs tell us which ones should be matched."

Already, Golub has catalogued several hundred drugs besides rapamycin. He aims to complete the task by mid-2007. —B.H.

CLINICAL PRACTICE

Transfusions harm some heart patients

Some patients who undergo coronary bypass surgery receive unnecessary blood transfusions as part of their follow-up care, a team of researchers contends.

As well as wasting a limited biological resource, the practice can also harm patients, says hematologist Jack Levin of the University of California, San Francisco.

Patients sometimes need transfusions of red blood cells to replenish those lost during coronary artery–bypass surgery, Levin says. However, he and his colleagues studied 940 patients whose operations had been free of major bleeding and who appeared to be at low-to-moderate risk of subsequent complications. Nevertheless, 190 of the patients had received blood transfusions.

Transfused patients had nearly twice as great risk of heart attack and four times as great risk of kidney failure as nontransfused patients did, the researchers found. Postoperative infections were also more common in the transfused group.

Among all patients in the study, transfusions appeared to add 2.5 days to the average hospital stay, which was 11.9 days among nontransfused patients, Levin reports. —B.H.

PROGNOSTIC BIOMARKERS

Protein predicts sickle-cell danger

A biological marker of heart trouble can be used to identify sickle-cell anemia patients who are at greatest risk of developing a serious complication.

Pulmonary hypertension—high blood pressure of the arteries in the lungs—puts stress on the heart and is a major cause of disability and death among sickle-cell patients. Doctors can diagnose pulmonary hypertension using an echocardiogram, but they have difficulty predicting which patients will develop it.

To try a different approach, Roberto Machado of the National Heart, Lung, and Blood Institute in Bethesda, Md., and his colleagues tested blood samples from 275 volunteers for B-type natriuretic peptide (BNP). In patients with other disorders, the heart is known to overproduce that protein when it has difficulty pumping.

In sickle-cell patients with pulmonary hypertension, the average BNP concentration was 206 picograms per milliliter (pg/ml). By contrast, average BNP was just 29 pg/ml in healthy volunteers and 46 pg/ml in sickle-cell patients who hadn't developed the blood-pressure disorder, Machado's team found.

To test BNP's value as a prognostic tool, Machado's team then measured the protein in blood samples taken in 1996 from 121 other sickle-cell patients. The researchers found that patients who had at least 160 pg/ml BNP in 1996 were three times as likely to have died by 2005 as patients with lower BNP levels were. —B.H.

ATMOSPHERIC CHEMISTRY

Ozone hole might not recover until the year 2065

The ozone-free zone that develops high in the atmosphere over Antarctica each summer was a result of the presence of chlorine- and bromine-containing chemicals may not heal until 2065, about 15 years later than previously projected.

Over most of the world, an ozone layer blocks much of the sun's ultraviolet radiation from reaching Earth's surface. However, in the extremely cold air over Antarctica, the combination of sunlight and certain gases, such as the chlorofluorocarbons used in refrigeration, readily destroys ozone.

At its yearly peak in early October, the ozone hole covered about 24.3 million square kilometers, an area about the size of North America. That's down from the hole's largest extent of 26.2 million km^2 in 1998 but not by as much as scientists had expected, says Dale F. Hurst, an atmospheric chemist with the National Oceanic and Atmospheric Administration in Boulder, Colo.

The production of many ozone-destroying chemicals was banned by international agreement in 1995, says Hurst. But concentrations of some of those chemicals low in the atmosphere over the United States and Canada—parcels of air that end up high over Antarctica 5 to 6 years later—hint that the chemicals are still used in significant quantities.

The recent measurements suggest that stockpiles of such gases may be larger than scientists had estimated. Recycling and reuse of those chemicals may be extending the life of such stockpiles, Hurst notes.

Using estimates of the atmospheric lifetimes of the ozone-destroying chemicals, researchers had projected that by 2050 the ozone hole over Antarctica would shrink to the size it was in 1980, the year that it was first noted. The atmospheric data gathered over the United States and Canada now suggest a 15-year delay in recovery, says Hurst. —S.P.

ENVIRONMENT

Where steel-belted radials go to die

A new technique for analyzing satellite images may enable researchers to easily identify sites where large numbers of used tires have been dumped.

MEETINGS

American Geophysical Union
December 5 - 9
San Francisco, Calif.

Automobile owners in California dispose of about 33 million tires each year, says Catherine Huybrechts, a geographer with Endpoint Environmental in San Francisco. Of those, around 8 million are dumped illegally. Tire piles can leach chemicals into the environment, serve as breeding sites for mosquitoes, and spew toxic clouds of smoke if they catch fire.

Huybrechts and her colleagues developed their tire-finding technique in a research project at NASA's Ames Research Center in Mountain View, Calif. The researchers first identify the darkest pixels in a satellite image taken in visible and near-infrared wavelengths. Depending on the landscape, the dark spots cover 1 to 13 percent of the image.

The researchers then narrow their search by eliminating pixels associated with known features such as parking lots and deep bodies of water. The remaining pixels may depict tire dumps, says Huybrechts.

The researchers' funder, the California Environmental Protection Agency, challenged them to find known tire dumps in satellite images of areas in California. The team identified all 12 piles of tires that the agency knew of, as well as a couple of previously unrecognized dumps.

The 4-meter resolution of the satellite images enabled Huybrechts and her colleagues to spot dumps with as few as 400 tires. —S.P.

BIOLOGY

Counting on technology to count elephants

Researchers often serve lengthy stints in remote areas to count and monitor the movements of large animals such as elephants. In the future, however, scientists may use seismic instruments to do the job, a new study suggests.

In field tests in Namibia in 2002, Jason D. Wood, a geophysicist at Stanford University, and his colleagues buried a geophone—essentially, a sensitive microphone—near a path used by wildlife. The scientists observed passing animals and then analyzed the seismic waves generated by their footfalls.

When the researchers looked at the amount of seismic energy transmitted at various frequencies, they found that the pattern generated by elephants typically differed from that due to lions, giraffes, or people. Wood and his colleagues could distinguish passing elephants from other animals about 82 percent of the time. Team members are still working to develop a technique that enables them to accurately estimate how many elephants are in a passing group.

The geophone could pick up the footfalls of an elephant about 100 meters away, says Wood. By placing arrays of geophones near oft-used paths or watering holes, scientists could unobtrusively conduct long-term surveys of elephant populations and their movements, Wood suggests. Currently, scientists estimate elephant populations by counting dung balls or conducting aerial surveys, techniques that are time-consuming, difficult, and expensive. —S.P.

EARTH SCIENCE

Satellite makes finest map yet of Antarctica

Using data gathered by a satellite launched almost 3 years ago, scientists have assembled the most comprehensive high-resolution map of Antarctica that's ever been made.

The laser altimeter onboard NASA's ICESat orbiter fires pulses of light down at Earth more than 40 times each second, says John P. DiMarzio, an engineer at NASA's Goddard Space Flight Center in Greenbelt, Md. The pulses, about 70 meters across when they reach the Earth's surface, reflect back toward the spacecraft. The time that each pulse takes to make that round trip reveals the elevation of the spot it hit.

ICESat collects elevation measurements down to latitude 86°S, a mere 450 kilometers from the South Pole. DiMarzio and his colleagues have assembled these data into a map that contains more than 100 million grid points spaced an average of 500 m apart. While the rocky fringes of Antarctica lie at sea level, the highest point on the ice sheet covering the continent has an elevation of 4,260 m.

Previous maps of Antarctica covered areas only down to 81.5°S, says DiMarzio. Also, those maps derived from data gathered by satellite-borne radar altimeters that cast a wider spot on Earth's surface than ICESat does and therefore had lower resolutions.

The new map of Antarctica will be available to the public early next year at *http://www.nsidc.org*, the Web site of the National Snow and Ice Data Center in Boulder, Colo. —S.P.

Books

A selection of new and notable books of scientific interest

SMITHSONIAN INTIMATE GUIDE TO HUMAN ORIGINS

CARL ZIMMER

In 2004, paleontologists working on the Indonesian island of Flores made an unprecedented find: fossils of a hominid with a human-size skull but a body only 3 feet tall. The ensuing dispute over the creature's relationship to modern humans is the latest in a long line of controversies over our ancestors. The author outlines what has been deciphered about the evolution of *Homo sapiens*, beginning with Charles Darwin's 1871 landmark conclusions in *The Descent of Man*. Zimmer, a science writer, reviews theories concerning pivotal points in human evolution, including the beginnings of bipedal walking, toolmaking, consciousness, and the migration out of Africa. Sidebars present more information about the evolution of language, the myth of the "missing link," and other topics. ***HarperCollins, 2005, 176 p., color photos, hardcover, $29.95.***

FROM SO SIMPLE A BEGINNING: The Four Great Books of Charles Darwin

EDWARD O. WILSON, ED.

In this volume, Wilson, a preeminent biologist and Harvard professor, compiles and comments on Charles Darwin's most influential works. *The Voyage of the Beagle*, published in 1845, chronicles a young Darwin's voyage around the world and the astute observations that would set the foundation for his theory of natural selection. *On the Origin of Species*, from 1859, and its follow-up The *Descent of Man, and Selection in Relation to Sex*, from 1871, spell out Darwin's landmark theory. In his 1872 book *The Expression of the Emotions in Man and Animals*, Darwin sought to demonstrate how facial expressions and postures serve as means of communication across animal species. Wilson concludes his compilation with an afterword about the ongoing struggles between evolution and religion. ***Norton, 2005, 1,504 p., b&w illus., hardcover, $49.95.***

CHARLES DARWIN, GEOLOGIST

SANDRA HERBERT

Exploration served an important purpose in early 19th-century Europe: to expand knowledge of the world's topography, provide specimens for museums, and gather scientific information. Charles Darwin's legendary trip on the *H.M.S. Beagle* from 1831 to 1836 was inspired by his desire to find out more about coral reefs, Earth strata, and fossils. Though he is most often thought of as a naturalist, Darwin was first a geologist. As a young man, he showed particular interest in rocks and minerals and carried out geological fieldwork, a habit he continued during his voyage. He carried an extensive library of geological references onboard the *Beagle*. In this illuminating portrait, Herbert outlines Darwin's contributions to the field of geology, from his collection and documentation of various geological specimens to his participation in the Geological Society of London. She examines Darwin's written observations about land features around the world and explores how geology influenced his ideas on species and evolution. Herbert, a professor of history, provides an unusual perspective on the intellectual development of this great thinker. ***Cornell Univ. Press, 2005, 480 p., b&w illus. and color plates, hardcover, $39.95.***

DARWIN: Discovering the Tree of Life

NILES ELDREDGE

Eldredge, curator of the American Museum of Natural History in New York City, scours the notes that Charles Darwin made during his landmark voyage aboard the *H.M.S. Beagle* but never published. The notes provide a glimpse into the mind of the man who set the stage for a lasting scientific understanding of evolution, Eldredge contends. He writes that Darwin was well aware of the reaction his observations would get from creationists of that time. As a result, he developed his theory in secret and waited to publish his work until some 20 years after his famous voyage to South America and the Galápagos Islands. Using four of Darwin's notebooks as his starting point, Eldredge considers the speculation, intuitive leaps, and logical reasoning that Darwin undertook to arrive at his theory. In so doing, the author marvels at the depth of knowledge and insight that Darwin held in the fields of both biology and geology. What results is a fascinating exposition of Darwin's skill as an experimental scientist and deductive reasoner. The book's publication coincides with an exhibit on Darwin at the American Museum of Natural History, launched in November. ***Norton, 2005, 288 p., color photos and illus., hardcover, $35.00.***

THE PLAUSIBILITY OF LIFE: Resolving Darwin's Dilemma

MARC W. KIRSCHNER AND JOHN C. GERHART

Charles Darwin's theory of evolution explains the mechanism by which plants and animals have developed and changed over time. However, the theory contains a major gap. Both supporters and skeptics of evolutionary theory have questioned how specialized features, such as a tiger's eye or a peacock's tail, could have arisen from random variation. Kirschner and Gerhart address this important question and offer an answer. They propose that organisms aren't passive players at the mercy of random genetic variation. Instead, all living things undergo change and adapt to their environments through a process called facilitated variation. In straightforward language, the authors explain how recent strides in evolutionary biology have brought scientists closer to understanding why and how certain features have been conserved over time and others have changed in ways that increase the likelihood of an organism's surviving to pass on its genes to the next generation. The result is a scientific rebuttal to the objections to evolution raised by proponents of intelligent design. ***Yale Univ. Press, 2005, 336 p., b&w illus., hardcover, $30.00.***

HOW TO ORDER Visit *http://www.sciencenews.org/pages/books.asp* to order these books or others. A click on the link under a book will transfer you to Barnes & Noble's Internet bookstore. Sales generated through these links contribute to Science Service's programs to build interest in and understanding of science.

LETTERS

Bends, the truth

I very much enjoyed "Cool Birds" (*SN: 10/22/05, p. 266*). What struck me, however, was a passage that mentioned the "bird's resistance to the bends" and the researchers' alleged inability to explain that. As a scuba diver, I know that the bends, or decompression sickness, is caused by breathing compressed air underwater. More nitrogen is absorbed in body tissue per breath taken, which can cause expanding bubbles when surfacing too quickly. The bends does *not* occur when free diving: holding your breath and not breathing compressed air underwater. I do not believe penguins breathe underwater and am therefore confused why they'd be expected to suffer from the bends in the first place.

BERT WISSIG, KAILUA, HAWAII

Decompression sickness occurs in people who free dive repeatedly to great depths, researcher Paul Ponganis points out. Even-deeper penguin depths (200 meters, routinely) force nitrogen to dissolve into the body. Rapid surfacing might be expected to trigger nitrogen to form the dangerous bubbles that cause the bends. —S. MILIUS

Think ahead, 1

"Slim and Sturdy Solar Cells: Nanocrystals offer path to electricity" (*SN: 10/22/05, p. 262*) describes an inorganic solar cell prototype utilizing two types of cadmium nanocrystals. Do we really need to aim toward mass-producing more items that contain cadmium? This heavy metal is a toxin and carcinogen that is known for fast uptake in plants and buildup in animals' fat. Risks associated with such a solar cell's manufacture and disposal seldom seem to be discussed. Why not look for alternatives now rather than wait for problems later?

VALERIE J. DELMEDICO, COLUMBUS, OHIO

Think ahead, 2

In "Ghost Town Busters" (*SN: 10/29/05, p. 282*), cleanup of radioactive particles that have seeped into porous building materials such as brick and marble appears to be difficult and expensive, even given the described breakthroughs. Perhaps a more proactive measure would be to require these materials to be impregnated with a stable polymer or similar compound that precludes the "soaking up" of undesirable materials and makes cleanup of a dirty bomb or everyday pollutants as simple as wiping or spraying down the surface.

SANDRA L. HUBSCHER,
ATLANTIC MINE, MICH.

SCIENCE NEWS
Of the year
THE WEEKLY NEWSMAGAZINE OF SCIENCE

Science News of Yesteryear

"Construction of two rigid airships of approximately 6,000,000 cubic foot capacity at cost not over $8,000,000 for both [was] authorized by Congress but no funds appropriated."

That item from 1926 led the first annual review of "Scientific Events" by *Science News-Letter*. In October of that year, Science Service began publishing a weekly printed newsletter in addition to the mimeographed packet of news stories that the organization had been providing primarily to newspapers. Every year since, the writers at *Science News-Letter* and then *Science News* have selected the most compelling stories that they covered. Since 1996, we've also put the list up on *Science News Online*, where it remains one of the most popular features throughout the following year.

So, what else was hot in science 79 years ago? Some stories covered lines of research still recognized as valuable today. For example, anthropologists regarded the discovery of a Neandertal skull as an opportunity to learn more about the habits of these extinct "people."

And: "The discovery that plants, as well as animals, have in their cells the special bits of living matter known as the sex chromosomes was announced ...."

This year, *Science News* echoed some items from that early news summary. For instance, "Earthquake on west coast of Sumatra cost 400 lives." This quake occurred about 500 kilometers southeast of the temblor that started the December 2004 tsunami (*SN: 1/8/05, p. 19*).

Some of the research from 1926 didn't stand the test of time, and other items are now difficult to comprehend. "The theory that vitamins have opposites, 'toxamins,' which occur in certain foods and prevent proper bone formation and cause serious nervous diseases, was advanced ..." To see more of the examples from the 1926 list, go to *www.sciencenews.org/articles/20051224/bob26.asp*.

It's anyone's guess which of the 2005 items listed in the following pages will turn out to be important advances and which will have future readers scratching their heads.

—Julie Ann Miller, Editor in Chief

HOW TO OBTAIN FULL ARTICLES This review lists important science stories of 2005 reported in the pages of Science News. The reference after each item gives the volume and page number on which the main article on the subject appeared (vol. 167 is January–June; vol. 168 is July–December). An asterisk indicates that the text of the item is available free on **SCIENCE NEWS ONLINE (www.sciencenews.org)**. Full text of any article can be obtained for $2.50 from ProQuest **(pqasb.pqarchiver.com/sciencenews)**. Back issues are available for $3 each (prepaid). Send orders to **SCIENCE NEWS**, 1719 N Street, N.W., Washington, D.C. 20036.

Anthropology & Archaeology

Wee relations New finds in an Indonesian cave indicated that a species of tiny, humanlike individuals lived there as recently as 12,000 years ago, although the evolutionary status of the group generated controversy (*168: 244*). An analysis of a fossil skull from one of the small island dwellers yielded hints of advanced brain organization (*167: 173*).

Researchers used new fossil finds and a digitally rebuilt skull to argue that the oldest known member of the human evolutionary family lived in Africa between 7 million and 6 million years ago (*167: 227).**

An unexpected discovery at an ancient Maya settlement suggested that the outpost had once been a city about which investigators have long speculated (*168: 227).**

DNA trail When scientists compared the genome of a chimpanzee with that of people, they discovered new molecular differences (*168: 147**). Other data suggested that people, but not nonhuman primates, have evolved changes in regulation of a gene that assists in making key brain chemicals (*168: 342*).

BRUNET; YALE UNIV.

* An asterisk indicates that the text of the item is available free on **SCIENCE NEWS ONLINE (www.sciencenews.org/articles/20051224/bob26.asp)**.

Civil signs Excavations indicated that the earliest known civilization in the Americas appeared about 5,000 years ago in what's now Peru (*167: 6*), not far from the area where researchers discovered South America's oldest irrigation canals (*168: 307*).

Few founders DNA data from Native Americans portrayed the original population of North American settlers as a group of only 200 to 300 people (*167: 339**).

With the grain Remnants of a Chinese site situated along a river included evidence of salt-making that began around 4,000 years ago (*168: 132**).

Hooking up Controversy flared over a fossil analysis indicating that human ancestors living in eastern Africa more than 3 million years ago formed long-term mating partnerships (*167: 379*).

Wave hello A new model of human evolution proposed that anatomically modern folk evolved in small groups that interbred with each other and created a genetic wave that moved from Africa across Asia (*168: 91*).

Big cuts Incisions on 130,000-year-old fossils previously found in a Croatian cave indicated that Neandertals ritually dismembered their comrades and perhaps ate them (*167: 244*).

Astronomy

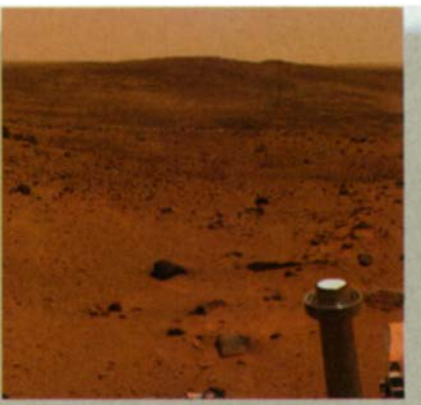
Titanic achievements A space probe parachuted onto Saturn's moon Titan and encountered terrain resembling parts of Earth (*167: 51*, 282*). The probe's mother craft found evidence of a methane-carved shoreline in the moon's southern hemisphere (*168: 286*).

Extrasolar planets Astronomers found the closest known cousin to Earth, a solid world just 15 light-years beyond the solar system (*167: 387**). A newly discovered extrasolar planet appeared to have the most massive core of any planet known (*168: 19*). A newfound, Jupiterlike extrasolar planet proved to be associated with a trio of stars, posing a puzzle: How can massive planets form in multiple-star systems (*168: 38**)?

Step aside, Pluto Astronomers discovered what may qualify as the 10th planet, a body larger and more distant than Pluto and possessing a moon (*168: 83*, 285*).

Grand slam NASA's Deep Impact spacecraft slammed into Comet Tempel 1 on July 4, producing some heavenly fireworks and excavating material that probably hadn't seen the light of day since the birth of the solar system 4.5 billion years ago (*168: 22*, 168**).

STILL GOING ON MARS
Nearly 2 years after they landed, the twin rovers on the Red Planet kept on rolling (*167: 235, 344*, 413; 168: 14, 164*). Among their recent accomplishments: discovering the first meteorite ever found on a planet other than Earth (*167: 124*) and identifying the saltiest known region on Mars. The high salt content indicates the region once had water coursing through it (*167: 221*).

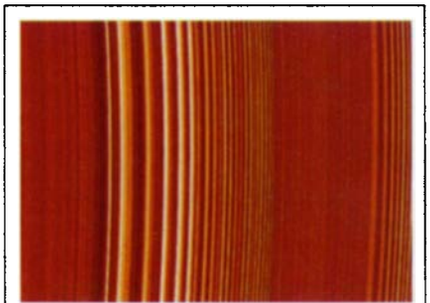


Pluto partners Pluto revealed two moons in addition to the one already observed there (*168: 291**).

Planet or not? A tiny dot of light showed up next to a young, sunlike star, but it could be either the glimmer of a brown dwarf or the long-sought image of an extrasolar planet (*167: 228**). Astronomers also debated whether an image of an object orbiting a brown dwarf qualifies as the first image of an extrasolar planet (*167: 291*).

Young and near Youthful versions of massive galaxies like the Milky Way might be only a cosmic stone's throw away from Earth, astronomers speculated (*167: 4*).

Mars geology Images taken a few years apart by spacecraft revealed that Mars has had recent landslides, freshly carved gullies, and a crater gouged in its surface no earlier than 1980 (*168: 196*). Images taken by two Mars spacecraft suggested that a volcano on the Red Planet erupted long ago at the confluence of two riverbeds, indicating that the region had water and heat, two prerequisites for life (*167: 269*). A flat region near the Red Planet's equator yielded evidence of a recently frozen ocean that was once as deep and big as the North Sea (*167: 149**).



Swooping above and below the plane of Saturn's rings, the Cassini spacecraft revealed how the gravity of Saturn's moons sculpts waves, kinks, and knots in the ring system (*168: 328). The craft spotted a new moon of Saturn, only the second one known to lie within the planet's main rings (*167: 349*).**

Lightweight world Astronomers for the first time discovered an asteroid with two moons (*168: 101**).

Atmospheric moon Saturn's moon Enceladus proved to have an atmosphere containing water vapor (*167: 253*). The body continues to feed its atmosphere by undergoing icy eruptions (*168: 141*).

Saturn says cheese Planetary scientists assembled the largest and most-detailed global portrait of Saturn ever made (*167: 190*).

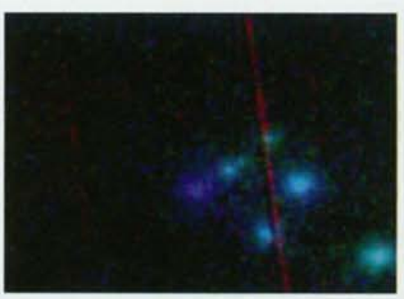
Planet potential Recording radio waves from the region around a young star, astronomers for the first time documented a key step in the rocky road to planethood (*168: 5*). Barely more massive than planets, some brown dwarfs were shown to be cloaked in disks of gas and dust from which planets may coalesce (*167: 83; 168: 416*). Warm dust seen surrounding a star only 41 light-years from Earth seemed analogous to the solar system's asteroid belt, an indication that a planet may also be present (*167: 259*).

Planetary territory The Hubble Space Telescope examined in unprecedented detail what may be one of the nearest and youngest homes yet discovered for extrasolar planets (*167: 30*). Astronomers found that a star-forming region 1,500 light-years from Earth contains stars with enough material around them to make planets (*168: 78*).

Heavenly flashes A telescope for the first time detected X rays from an ongoing gamma-ray burst, the most powerful type

JPL/NASA, CORNELL; JPL/NASA, SPACE SCIENCE INSTITUTE

of explosion in the universe (*167: 110*). The brightest flash of light ever recorded from beyond the solar system could provide information about a puzzling group of extremely short-lived gamma-ray bursts from distant galaxies (*167: 132*). Another short-lived gamma-ray burst may have given astronomers their first glimpse of two neutron stars colliding to forge a black hole (*167: 308**). Astronomers found the most-distant, and oldest, gamma-ray burst ever, hailing from just 900 million years after the Big Bang (*168: 179**).



X-ray telescopes captured the earliest and clearest view of the core of a gas cloud about to transform into a star (*167: 174*).

Influential monsters Supermassive black holes showed effects on galaxies far beyond the black holes' gravitational grasp (*167: 52, 158*).

Ancient echoes Astronomers for the first time detected the surviving notes of a cosmic symphony created just after the Big Bang (*167: 35**).

Big neighbor Estimates tripled for the diameter of the disk of the Andromeda galaxy, the nearest large galaxy to the Milky Way (*167: 398*).

Some like it hot A new theory of planet formation suggested that sizzling-hot, Earthlike planets might be abundant throughout the Milky Way and will soon be detected (*167: 203**).

Oldster Astronomers found one of the most chemically primitive stars known, dating to just a few hundred million years after the Big Bang (*167: 244*).

Bowled over New simulations proposed that the solar system's four biggest planets were once bunched together, suggesting that a planetary bowling game rapidly rearranged the structure of the outer solar system and tossed chunks of debris toward the sun (*167: 340*).

Speedstar Astronomers discovered a star moving so fast that it will eventually exit the Milky Way (*167: 142*).

Ice in the rock Hubble Space Telescope observations suggested that as much as one-fourth of the mass of Ceres, the largest known asteroid, might be frozen water (*168: 206*).

Cosmic crisis? Baby galaxies that hail from the early cosmos but appear mature and nearly as massive as the Milky Way suggested a challenge to the standard theory of galaxy formation (*168: 235*).

Behavior

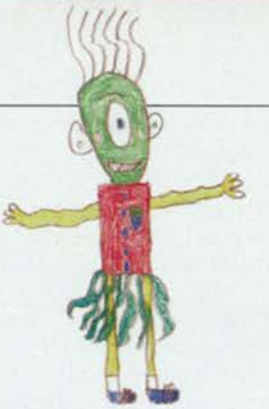
Mental ills A national study found that half of all adults develop a mental disorder at some time in their lives, although most cases are mild (*167: 372*).

Scripted genes Two genes influencing brain development showed signs of contributing to the learning disorder known as dyslexia (*168: 292*). Brain-scan investigations unveiled neural paths crucial to effective reading (*167: 280**).

Eau de trust Experiments indicated that people become more trusting of others in financial deals after smelling a spray containing the brain hormone oxytocin (*167: 356**).

DNA downer People who possess one common version of a gene that regulates the neurotransmitter serotonin showed sensitivity to stress and an apparent susceptibility to depression (*167: 308*).

Meds update In treating schizophrenia, a recently developed and heavily marketed class of antipsychotic drugs showed no superiority over older, cheaper antipsychotic medications (*168: 195*).



New research highlighted the surprisingly large number of well-adjusted preschoolers who play with make-believe friends (*167: 200**).

Thought relief People told to think in positive ways displayed a simultaneous quelling of activity in the brain's pain centers and a drop in actual feelings of pain (*168: 164**).

Educating attention Children who completed a brief course on how to focus their attention exhibited improvements on either intelligence or attention tests (*168: 214*).

Stress rebound Rats that suffered stress because their mothers were negligent in providing care for a short time after birth showed memory losses and related brain disturbances in middle age (*168: 261*).

Spatial lift Tests indicated that Chinese children outscore Western kids in IQ because reading the pictorial symbols in Chinese writing fosters superior spatial abilities (*167: 99*). Other evidence raised the profile of environmental influences on the often-noted superiority of boys to girls in spatial skills (*168: 323*).

Lighten up Brief periods of daily exposure to bright light showed promise as a way to fight off symptoms of major depression (*167: 261**).

NIGHT CRUSH

Cross-cultural investigations identified the widespread phenomenon of sleep paralysis as a factor in various anxiety disorders, including post-traumatic stress disorder and panic disorder, as well as an influence on popular beliefs in a spirit world inhabited by supernatural beings (*168: 27**). During sleep paralysis, a person awakens to a crushing sensation on the chest and senses great danger but can't move.

HAMAGUCHI ET AL., NASA, ESA; THE NIGHTMARE, 1781, H. FUSELI. FOUNDERS SOCIETY PURCHASE, WITH FUNDS FROM MR. & MRS. B. SMOKLER AND MRS. L FLEISCHMAN. PHOTOGRAPH © 1997 THE DETROIT INSTITUTE OF ARTS; M. TAYLOR

Strong recall Danes who had experienced Nazi occupation of their country demonstrated surprisingly accurate memories of their World War II experiences (*167: 326*).

Biomedicine

Flu fears Scientists tracked the spread of a threatening influenza virus in birds and explored strategies that could be used to halt a potential pandemic in people (*168: 171**). Meanwhile, the most readily available drugs against influenza were shown to have recently declined in effectiveness (*168: 211**).

HIV transmission Men who get circumcised reduce their risk of acquiring the AIDS virus, HIV, by more than half, research showed (*168: 275**). People with HIV are more infectious to their sexual partners immediately after they acquire the virus than they are later on (*167: 260*). And because a drug used to block the transmission of HIV from mother to infant can make the mother more vulnerable to AIDS, researchers looked for inexpensive alternatives (*167: 394*).

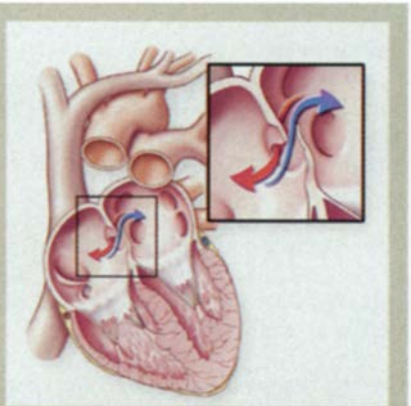
Unique cure A 15-year-old girl in Wisconsin survived a rabies infection without receiving the rabies vaccine, a first in medical history (*167: 77*).

Promising shots A vaccine against the virus that causes most cervical cancers passed a major test (*168: 243*), as did a vaccine for the painful skin disease known as shingles (*167: 358*). Another immunization, this one targeting the microbe that causes strep throat, generated a potent immune response in adults (*168: 270*). Researchers working with animals tested promising vaccines against tuberculosis (*168: 115*) and genital herpes (*167: 5**) in people.

Diabetes Transplanting insulin-making pancreas cells from a cadaver into people with type 1, or juvenile-onset, diabetes reversed the disease (*167: 157*). Scientists developed a technique for mass-producing the cells (*168: 212*), and monoclonal antibodies targeting immune cells saved the pancreatic cells from autoimmune attack for more than a year (*168: 263*). A study found that insulin itself might precipitate the immune system's attack in type 1 diabetes (*167: 333*).

Cancer treatments A drug combination that inhibits an enzyme found in tumor cells showed promise (*167: 349*). Heat treatments boosted radiation therapy (*167: 294*) and sensitized tumor cells to the effects of a genetically modified virus, which then killed them (*168: 85*). Two drugs sent chronic myeloid leukemia into remission (*167: 14*), but certain widely used antidepressants and some women's genetic make-up were suspected of diminishing the effect of tamoxifen, a frontline breast cancer drug (*167: 21*).

Viagra and Co. Drugs used mainly to treat erectile dysfunction eased high blood pressure in the lungs (*167: 14*), seemed to protect fetuses in pregnant women with preeclampsia (*167: 254*), and showed promise as treatments for heart disease and other conditions (*168: 124**).



NO HEADACHE
Migraines may be among the problems that stem from a common but rarely diagnosed heart defect. Researchers discovered that repairing the defect prevents some headaches (*167: 119**).

Cancer testing Protein concentrations in a woman's blood revealed hard-to-detect ovarian cancer (*167: 307**). Scientists pieced together how mutations in a protein called EGFR can lead to various malignancies (*168: 139*) and clarified the role of microRNA in cancer progression (*167: 371**). A gene called *Reprimo* proved to be shut down in several cancers but rarely in healthy cells (*168: 35**), and another gene, *MGMT*, was shown to often be silenced in colorectal cancer (*168: 221*). A study revealed that overactive genes in breast tumors betray a genetic signature that doctors could use to predict whether and when a woman's cancer might spread (*168: 126*). A demonstration that healthy and cancerous cells alter laser light in distinguishable ways may lead to instant identification of cancer (*167: 237*).

Ailing heart Studies showed that people who are frequently out of breath have an increased risk of dying from heart problems (*168: 291*). A new drug suppressed an inflammation-causing protein linked to heart attacks (*167: 365*). Low doses of the chemical that causes marijuana's high slowed the progression of atherosclerosis (*167: 301*), while depressed patients recovering from heart attacks benefited from drugs called selective serotonin reuptake inhibitors (*168: 20*).

Trauma center Hundreds of injured soldiers returning from Iraq and Afghanistan were found to harbor an unusual bacterium that complicates wound healing (*168: 270*). U.S. football players developed drug-resistant bacterial infections from artificial-turf abrasions (*167: 85**).

Gastric bypass Obese people who had opted for weight-loss surgery showed increased odds of subsequent hospitalization compared with their hospitalizations in the previous year, and some groups had an elevated risk of death (*168: 260*).

Cancer risk The incidence of nonmelanoma skin cancers in young adults proved to be mushrooming, possibly heralding an epidemic of cancers during the coming decades (*168: 99**). Just a few cigarettes a day hiked people's cancer risk three- to five-fold (*168: 213*). A long-term study found no evidence that occupational exposure to electromagnetic fields triggers breast cancer (*167: 142*). Over-the-counter anti-inflammatory medication reduced smokers' likelihood of developing mouth cancers (*167: 302*), and a study showed that calcium supplements protect against colorectal cancer for years after a person stops taking the pills (*167: 302*).

False hopes The herbal remedy echinacea showed no benefit against the common cold (*168: 70*). Vitamin E supplements didn't help, and might even have hurt, people with histories of heart disease or diabetes (*167: 182**).

Stroke help A blood-clotting drug speeded recovery in some people with bleeding strokes (*167: 133**). A drug derived from a component of vampire-bat saliva cleared blood clots in the brains of people who had had blockage-type strokes (*167: 126*). People recovering from strokes showed less vitamin D in their systems than did healthy peers (*167: 126*).

Multiple sclerosis Adult stem cells were shown to kill inflammatory immune cells and so protect the brain against inflammation in brain disorders including MS (*168: 36*). A protein produced by nerve cells proved essential for making the fatty sheath

CLEVELAND CLINIC FOUNDATION

MASTERING MALARIA
Two research teams found independently that fungi can kill mosquitoes or at least their efficiency at transmitting the malaria parasite (*168: 106*). An experimental vaccine against the parasite induced an immune response in people similar to that mustered by people who reside in malaria regions (*168: 382*). The parasite may facilitate its own spread by making infected people more alluring to mosquitoes (*168: 157*).

that surrounds healthy nerve fibers but erodes in MS (*168: 163*). People who grow up with younger siblings close to them in age were less likely to develop MS than were people without such siblings (*167: 68*).

HIV and AIDS Medical care for people infected with HIV has saved about 2 million in years of life in the United States, but more than 200,000 U.S. residents have undiagnosed HIV infections and so aren't receiving treatment (*167: 147*). A compound called valproic acid, in combination with other drugs, ferreted out HIV lying dormant in cells (*168: 174*). An experimental vaccine given to people infected with HIV appeared to reduce their dependence on antiviral drugs (*167: 174*). An experimental protease-inhibitor drug seemed to help AIDS patients for whom existing drugs fell short (*167: 205*).

Neurology Penicillin and related antibiotics appeared to prevent the type of nerve damage that occurs in people with amyotrophic lateral sclerosis and other diseases (*167: 46*). Brain surgery has kept many people with severe epilepsy free of seizures for decades (*168: 30*). A study found that emotional stress can lead to symptoms that mimic a heart attack (*167: 100**). A new biochemical profile of blood promised earlier diagnoses of autism (*167: 254*). A cell-surface protein found in the nervous system was implicated in neuropathy (*167: 227*).

Racial medicine Taking race into account when choosing medical treatments could be a stepping-stone to targeting medicines according to individual patients' genetics, but some researchers were troubled by the implications of race-based medicine (*167: 247**).

Acute care Some heart attacks are diagnosed at hospitals that can't offer the best treatment, but emergency transport to a better-equipped facility has its own risks, studies revealed (*167: 408*).

Alzheimer's disease A new test that detects the beginnings of protein clumps associated with Alzheimer's promised to be a means of providing an early warning of the disease (*167: 83**). Putting extra copies of the gene for a nerve-cell-growth factor into the brains of people with Alzheimer's disease appeared to slow the degenerative condition (*167: 275**). Biomedical engineers developed polymer molecules that bind to and block the activity of proteins associated with Alzheimer's (*167: 222*).

Hemorrhagic viruses Two new vaccines protected monkeys against the lethal Ebola and Marburg viruses (*168: 45*). Animal carcasses were found to provide timely clues about impending Ebola virus outbreaks (*167: 84*).

Aneurysms Insertion of tiny platinum coils to seal off bleeding brain aneurysms appeared safer in the long run than conventional brain surgery (*168: 180*).

Feeling sleepy High schools that begin classes as early as 7:30 a.m. were found to deprive teenagers of sleep, and attempts to reset adolescents' biological clocks failed to solve the problem (*168: 14*). Another study discovered that nighttime acid reflux often goes hand in hand with sleep problems (*167: 325*).

Cancer mechanisms Aging of blood-producing stem cells appeared responsible for the relatively high incidence of infections and myeloid leukemia in the elderly (*168: 29*). Some tumor cells were found to corrupt neighboring cells into forming blood vessels that then nourish the cancer (*168: 54*).

Stem cells Researchers prodded stem cells in heart muscle damaged by a heart attack to regenerate healthy tissue there (*168: 45*). Using umbilical cord blood, doctors rescued babies from Krabbe's disease, a lethal enzyme deficiency that causes brain damage (*167: 323*).

Antibiotic rescue Doxycycline cured cases of elephantiasis (*167: 404*), and a single dose of ciprofloxacin stopped cholera in children as well as a 12-dose regimen of erythromycin did (*168: 286*). But antibiotics for acne might predispose an individual to upper respiratory infections (*168: 221*).

Big pharma Drug companies' overaggressive marketing of risky drugs is hurting public safety, researchers asserted (*167: 90**). Pfizer pulled its prescription pain reliever valdecoxib (Bextra) off the market in response to safety concerns (*167: 269*).

Pregnancy A simple urine test might warn women that they have an increased risk of preeclampsia, a dangerous complication of pregnancy (*167: 78*). A shot that primes the immune system against a sperm protein showed promise as a male contraceptive (*167: 12*).

Cycling risk Professional bicycle riders who had competed in grueling races showed signs of heart damage decades later (*168: 350*).

Blood boost An experimental drug revved up production of platelets in people with severe shortages of these clotting agents (*167: 14*).

Ophthalmology Wearing an eye patch improved vision in children, up to age 17, with amblyopia, or lazy eye (*167: 317*).

Tissue tinkering Tissue engineers for the first time used genetically modified human stem cells to repair damaged hearts in guinea pigs (*167: 19*).

Early progress In children who were born deaf, cochlear implants engendered better hearing the younger the child receiving them (168: 371).

Botany & Zoology

Elvis lives A video, glimpses by veteran birdwatchers, and recordings of knock-knock sounds convinced many people that the storied ivory-billed woodpecker has not gone extinct after all (*167: 291*, 376*; 168: 134**).

Weird repair *Arabidopsis* plants revealed a curious capacity to reinstate genes missing from their chromosomes but that had been carried by previous generations (*167: 235*).

Plant hormone More than 70 years after biologists identified the powerful plant hor-

H. STURROCK/UNIV. EDINBURGH

mone auxin, they finally found a receptor in plant cells that binds it (*168: 14*).

The deep Researchers found a photosynthetic microbe that uses light from hydrothermal vents in the deep sea rather than from the sun (*167: 405**).

Sleepless Moms and newborns among orca whales and dolphins appeared to skip sleep for as long as a month after births (*168: 3**).

New voices African elephants appeared to be the first land mammals other than primates to learn vocal imitations (*167: 197**). Recordings suggested that male mice serenade prospective mates at pitches about two octaves above the shrillest sounds audible to people (*168: 293**).

Not so faithful A study found that prairie voles, presumed to be models of monogamy, have a substantial number of out-of-pair sexual encounters (*168: 142*).

Mixed tuna The largest study yet of tagged Atlantic bluefin tuna suggested that two groups of the fish feed together but spawn on opposite sides of the ocean (*167: 277*).

Singing in the brain Young white-crowned sparrows didn't have to hear a song straight through in order to learn it but could piece it together from shuffled phrase pairs (*167: 46*). Researchers learned that young zebra finches get worse at performing newly learned songs after they sleep but recover and then improve as the day goes on (*167: 118**).

NILSSON, B. HAMNER (BOTTOM); PROC. ROYAL SOC.; HWANG;

EIGHT EYES
Scientists found that eight of a box jellyfish's eyes have superb lenses, but their structure prevents them from focusing sharply (*167: 307**).

For the first time, researchers photographed a living giant squid in the wild (*168: 253*).

Splitsville Populations of European corn borers that favor different host plants offered a new model for how one species might split in two (*167: 286*).

Extreme fitness Observations revealed that when a Burmese python eats, it can bulk up its heart muscle 40 percent in just 2 days (*167: 149**).

Flower power Common flowers, such as four-o'clocks and portulacas, proved to be truly fluorescent in visible wavelengths (*168: 180**).

Mars-Venus Researchers declared one kind of male and female fire ants nearly separate species because males and queens essentially clone themselves (*168: 6*).

Crowbars A rearing test showed that the New Caledonian crow has an innate tendency to make and use tools (*167: 38**).

Cell & Molecular Biology

Embryo imbroglio A South Korean scientist claimed to create 11 new stem cell lines by priming embryonic cells with DNA (*SN: 167: 323**), but he later sought to retract the study after a coauthor said that some of the data were faked (*SN: 168:406**).

Hearing repaired By turning on a gene that's normally active only during embryonic development, researchers restored hearing in deaf guinea pigs (*167: 115**).

Killer revived Two new studies shed light on the 1918-flu virus. One team of researchers wrapped up efforts to sequence the virus' genome, and another team used the genes to construct a living model of the killer flu (*168: 227**).

Do no harm Scientists devised two new ways to isolate embryonic stem cells without destroying viable embryos: by multiplying a single cell removed from an embryo and by removing a gene pivotal to normal development (*168: 259**).

Charting individuality Scientists completed a new map that delineates small genetic differences among people, which could eventually be used to figure out why some individuals get certain diseases and how to customize their treatments (*168: 277**).

DOUBLE DOG
Researchers said that they had cloned the first canine, an Afghan pup (*168: 83**), but the feat was questioned when the scientists later asked to retract a report of other stem cell research (*168: 406**).

Same difference A study of identical twins indicated that environmental influences affect which of a person's genes are turned on or off throughout life (*168: 19**).

Frozen in time Researchers put mice in suspended animation by exposing them to low concentrations of hydrogen sulfide. A similar hibernation-like state could eventually help people endure the long wait for organ transplants or limit damage from strokes (*167: 261**).

Make a muscle Scientists created slivers of muscle in the lab that produce their own network of blood vessels, a first for the field of tissue engineering (*167: 405*).

Gray's roots Scientists unveiled that the major cause of hair going gray is aging and

death of stem cells that bear pigmented cells within hair follicles (*167: 61*).

Sugar coated The mammalian immune system doesn't attack native gut bacteria as foreign invaders because the bacteria disguise themselves with the same sugar molecules that gut cells secrete, researchers found (*167: 180*).

With the help of satellites, scientists obtained the first photos of a phenomenon known as a milky sea, an expanse of seawater filled with bioluminescent bacteria (*168: 213**).

The short haul Scientists devised a way to make single-cell algae bear loads over distances of several centimeters, a tactic that could prove useful in miniature machines (*168: 117**).

Longer life A class of antiseizure drugs significantly extended the life span of roundworms. (*167: 94*).

Chemistry

Greener nylon A one-step process synthesized the primary ingredient of nylon-6, used to manufacture items ranging from clothing to car parts, in an environmentally friendly manner (*168: 179*).

Presto, change-o A simple technique to switch an oil-like solvent into a waterlike one promised to provide chemists with a way to avoid some environmentally troublesome solvents (*168: 133*).

Cactus purifies water Scientists investigated a substance inside nopal cactus leaves that can separate solids and heavy metals from water. The group planned to make an inexpensive water filter for small Mexican communities (*168: 190**).

Lube tune-up A technique that transforms recycled plastic into high-performance lubricating oils promised to boost the fuel efficiency of vehicles (*167: 406*).

Into the void Chemists devised a way to create crystalline material with some of the biggest pores yet, which could be catalysis sites for large molecules (*168: 212*).

Crystal clear Growing drug crystals on polymer surfaces increased the variety of crystalline forms, a development that could be used to create new pharmaceuticals (*167: 317*).

Molecular cage Researchers devised a technique to lock a pair of hydrogen atoms inside a carbon buckyball, an approach that promised to endow the structures with unique electronic properties (*167: 125*).

Artificial cells Scientists created artificial cells that can live and produce proteins but can't replicate, providing a new tool for studying cellular processes (*167: 78*).

Hungry for hydrogen Microbes dwelling in Yellowstone National Park's hot springs derive energy from hydrogen rather than sulfur, a study found, suggesting that hydrogen metabolism by bacteria may be common (*167: 69*).

Biblical palette deciphered Scientists characterized the paints decorating the margins of Gutenberg Bibles, information useful for restoring and preserving the books (*167: 366*).

An ultrathin coating made up of water-loving nanoparticles and tiny air pockets prevented fogging and glare on glass surfaces (*168: 148**).

WHIFF WEAPON
Scientists identified the primary chemical components of the pheromone that guides sea lampreys to suitable spawning areas, the first migratory pheromone discovered in a vertebrate and a possible new lamprey-control tool (*168: 308**).

Novel hydrogen reaction Chemists found a new, if not yet practical, way to produce hydrogen using only water, an organic liquid, and a metal catalyst (*168: 190*).

How hot was it? Heat-sensing polymers, filled with photoluminescent dyes, indicated exposure to high temperatures by changing color under ultraviolet light (*168: 190*).

Nosy nanotubes Researchers demonstrated that individual nanotubes decorated with DNA could rapidly detect gases, including the explosive dinitrotoluene and a derivative of the poison sarin (*168: 238*).

Color trails A new chemical technique for extracting natural dyes from ancient textiles promised to reveal the dyes' plant origins and perhaps much about how ancient people used natural resources (*167: 230*).

Exclusive pigmentation The spectacular red feathers of certain parrots owe their vibrancy to a rare set of pigments found nowhere else in nature, a study found (*167: 190*).

Earth Science

Big shock The tsunami-triggering earthquake that struck west of Sumatra on Dec. 26, 2004, was the largest temblor in more than 40 years (*167: 19**). The estimated 9.3-magnitude quake ruptured 1,300 kilometers of an undersea subduction zone, rumbled for more than 10 minutes, and even triggered small quakes in Alaska (*168: 136**). Scientists say that the Sumatra temblor significantly redistributed

MILLER; UNIV. MINNESOTA; RUBNER

stress in Earth's crust and probably caused a nearby 8.7 magnitude quake 3 months later (*167: 211*).

Tsunami disaster Spawned by the December 2004 quake, tsunamis swept coasts around the Indian Ocean (*167: 19**) and killed hundreds of thousands of people. Data from several satellites, downloaded after the event, captured the waves' deadly progress (*168: 136**). The tsunamis were steered by midocean ridges and measured more than 50 centimeters in height even after traveling 20,000 kilometers (*168: 133*). Intact mangrove forests along India's southeastern coast protected some villages, but waves wiped out neighboring settlements that weren't sheltered by vegetation (*168: 276**). Within weeks, the Bush administration announced a $37.5 million program to expand the United States' tsunami-warning capabilities (*167: 54*).

To catch a wave Scientists reported that seafloor sensors near the Mississippi River delta detected a 27.7-meter wave, the tallest ever recorded, when Hurricane Ivan swept over the instruments in September 2004 (*167: 382**).

Explosive potential Only a dozen or so of the United States' 169 volcanoes are monitored as well as they should be, U.S. Geological Survey scientists reported (*167: 293**).

Shakedown Patterns of deep tremors offered scientists a possible new way to foretell earthquake activity beneath California's San Andreas fault (*167: 4**).

Quick pick-me-up A new model describing airflow across the ocean's surface suggested that droplets whipped from waves boost the wind's speed over the water (*168: 94**).

Pack rat piles Analyses of fossilized pack rat collections revealed that the Grand Canyon was surprisingly cool during the latter part of the last ice age (*168: 198**).

Warm spell Sediment samples taken from remote arctic lakes indicated that the climate across large swaths of the Northern Hemisphere has been warming for many decades (*167: 148**).

Big chill Analyses of a soil sample from central Missouri suggested that North America's most recent spate of ice ages began about 2.4 million years ago (*167: 94*).

Sky high Enigmatic bursts of high-energy gamma rays produced in Earth's atmosphere were found to be unexpectedly strong and frequent (*167: 115*).

Useful noise Scientists established that the small, random, and nearly constant seismic waves that travel in all directions through Earth's crust can be used to make ultrasoundlike images of geologic features (*167: 382*).

Shaken, then stirred Data gathered by equipment installed on an immense iceberg off Antarctica suggested that the ground motions spawned by large, distant earthquakes could free grounded icebergs to float again (*167: 45*).

Debate continued about whether global warming is making hurricanes stronger and more frequent (*168: 184). Meanwhile, the North Atlantic experienced its most active hurricane season ever (*168: 406*), with 14 of 26 named storms reaching hurricane status, three reaching category 5 status, one—Wilma—being the strongest hurricane on record, and another—Katrina (shown above) —being one of the nation's costliest hurricanes.**

Volcano blow The decline in sunlight reaching Earth after a major volcanic eruption can cool the seas and cause sea level to drop slightly (*168: 294*), a study found, and volcanic sulfates that fall on wetlands can stifle natural emissions of methane from those regions (*167: 390*).

Under pressure By squeezing quartz-bearing minerals at high pressure and zapping them with a laser, scientists created a crystalline form of silicon dioxide previously unknown on Earth (*168: 84*). Another team found that compressing a common iron-bearing mineral to deep-Earth pressures makes the material much stiffer, which might explain why seismic waves travel particularly fast through some parts of Earth's crust (*168: 52*).

Mighty river Global-positioning-system data showed that when the Amazon River swells each rainy season, the immense weight of the water causes the region to sink dozens of centimeters (*168: 189*). Other analyses suggested that much of the carbon in the carbon dioxide emanating from the river had been stored in plants for less than a decade (*168: 93*).

Powerful winds There's more than enough wind power to satisfy the United States' energy requirements, a new analysis of weather data suggested (*168: 36*).

Storms coming Scientists developed a new computer model that analyzes summer-wind patterns and predicts whether the United States will suffer a damaging hurricane season (*167: 262**).

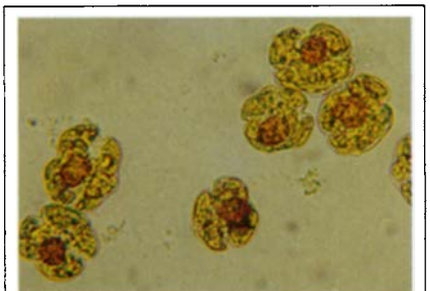
Environment & Ecology

Nanohazards Inhaling microscopic nanospheres and nanotubes, as people manufacturing them might do, appeared to trigger damage well beyond the lungs (*167: 179**).

Squirt alert Scientists around the world reported that a sea squirt of unknown origins has begun overtaking ecosystems in cool coastal and offshore waters (*168: 411**).

Gender measure Researchers linked fetuses' modest exposures to certain common solvents and plastics ingredients with genital changes in infant boys (*167: 355**). Newborns in intensive care units absorb high concentrations of at least one of these chemicals, called phthalates, from the equipment used to treat babies, a study found (*168: 109*).

Emptying nets New research challenged long-held assumptions about the wisdom of harvesting big fish ahead of little ones (*167: 132*, 360*).



Scientists discovered three new ways that Florida's red-tide alga can harm people and marine animals but also found antidotes produced by the alga itself (*168: 56).**

NASA; MOTE MARINE LABORATORY

SCIENCE NEWS
Of the year

Stuck with nonstick From fetal life on, studies showed, people carry residues of the fluorochemicals which are used to make nonstick products and which have shown toxicity in lab animals (*168: 341*).

Man trouble Men had lower sperm counts and fragmented DNA in their sperm after they breathed air rich in ozone and other pollutants (*168: 230*).

Hog wild Many airborne bacteria in pig barns proved invulnerable to antibiotics, confirming that drug-resistant germs can spread through the air (*167: 5*).

Investigating payoffs In an effort to guide conservation, scientists continued mapping the world's ecosystem services according to their economic value (*168: 364*).

Scents of danger Researchers found that fragrance chemicals can disable cells' capacity to eject toxic substances (*167: 187*).

Clouded minds A study suggested that millions of U.S. children suffer reading deficits caused by exposure to secondhand tobacco smoke (*167: 37*).

Imperiled amphibians Ozone and pesticides offered two additional possible explanations for the decline in frogs, toads, and other amphibians being recorded worldwide (*167: 94; 168: 222, 381*).

Alarm allayed A massive, long-term Swedish study found no support for concern that work exposures to electromagnetic fields might trigger breast cancer (*167: 142*).

Arsenic crazy The madness of England's King George III may have been partly due to arsenic poisoning, a review of historical accounts found (*168: 94*).

Toying with pollution Stuffed animals were shown to accumulate some potentially toxic air pollutants in disturbingly high amounts (*168: 381*).

The toxic underground Airborne particles in subway stations may be more damaging to human cells than are particles in street-level air, researchers said (*167: 124*).

Solo-sniffer genetics Scientists nailed down a single gene that seems to oversee the sense of smell in a variety of insect species (*167: 173*).

Fetal risks A study found that pregnant women who breathe polluted air deliver babies that are smaller and more likely to exhibit congenital birth defects than are children born to other mothers (*167: 61; 168: 158*).

Painting out corals A barnacle-deterring pesticide in paints used on ship hulls was suggested as a contributor to the worldwide decline in corals (*167: 206*).

Food Science & Nutrition

Hungering hormone Diet and lifestyle can induce the body's overproduction of a hormone that might foster overeating, researchers found (*167: 216**).

Wild menus A scarcity of fish and rising wealth in the developing world appeared as factors driving the accelerating harvest of bushmeat—from the flesh of anteaters to that of chimps—for dinner tables globally (*167: 138**).

Soy seesaw Tests showed that as protein yields of soybeans rise, there's a decline in the quality of the proteins, making them less effective for promoting growth in livestock and children (*168: 61*).

Proper popper The secret to better popping was proved to reside in the crystalline structure of the popcorn kernel's hull (*167: 276**).

Salt licked A heavy consumer of salt is nearly twice as likely to have a stroke as is a person who consumes little of the seasoning—even if the two individuals' blood pressures are equivalent—researchers found (*167: 126*).

Heartier rice Inserting a human gene into rice enabled that crop to survive an array of weed-killing chemicals (*167: 246**).

Mental metal Zinc fortification improved mental skills in children with normal, healthy diets, suggesting that the officially recommended intake for this mineral is too low (*167: 286*).

Peanut protection A study showed that African peanut farmers could cut their exposure to aflatoxins—harmful fungal poisons—by more than half if they would adopt some simple harvesting procedures (*167: 374*).

Garlic tonic Fresh garlic or its powdered equivalent appeared to prevent, in some people, a potentially lethal condition in which blood pressure in the lungs becomes elevated (*167: 254*).

Olive therapy A molecule in extra-virgin olive oil demonstrated anti-inflammatory properties similar to those of ibuprofen, perhaps explaining some health benefits of Mediterranean diets (*168: 147*).

Raisin defense Researchers suggested that eating dried grapes can fight tooth-decaying bacteria rather than feed them (*167: 414*).

Herpes helper A compound in licorice homed in on lab-grown cells infected with a herpes virus and induced them to self-destruct (*167: 285*).

Mathematics & Computers

Pieces of numbers A long-sought proof forged an intriguing link between numbers expressed as sums and as products (*167: 392**).

Prime whopper Computers discovered a new largest prime number; it has a whopping 7,816,230 digits (*167: 188**).

Pushing limits Scientists moved several steps closer to constructing supereefficient, noisefree, data-transmission codes (*168: 296**).

Untangled Web A new mathematical model of the Internet showed that it might not be

ARS/USDA

COLOR ME HEALTHY
Deep-hued plant pigments—such as those coloring these potatoes — were shown to confer health benefits, from fighting heart disease and obesity to preserving memory (*167: 27*; 168: 366*).

Mathematicians zeroed in on a remarkable minimal surface that looks like a double helix with a hole through it (*168: 393**).

as vulnerable to centralized attacks as previous research had suggested (*168: 230*).

Celestial currents Mathematicians created an atlas of solar system highways along which spacecraft could coast, using virtually no fuel (*167: 250**).

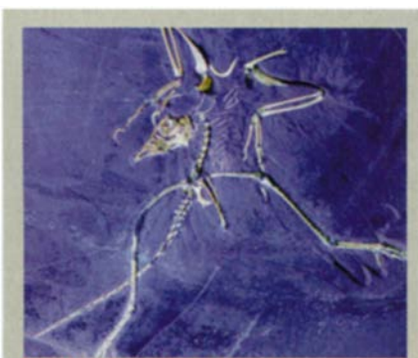
Laziness pays Researchers developed a mathematical model that helps explain how cooperation and cheating evolve among simple organisms (*167: 35*).

Paleobiology

Old softy Scientists recovered pliable material from a *Tyrannosaurus rex*'s leg bone, including possible cells and blood vessels (*167: 195**).

Egg citing The first find of shelled eggs inside a dinosaur fossil bolstered ideas about the reptiles' reproductive physiology (*167: 243**).

Young and helpless Skeletal remains in the fossilized eggs of an early dinosaur hinted that adults of that species may have cared for their hatchlings (*168: 68**).



NEW OUTLOOK ON LIFE
A newly described specimen of *Archaeopteryx*, only the 10th known, provided novel viewing angles of several key body features (*168: 355*).

WEBER; MAYR/SENCKENBERG RESEARCH INST.; K. NOVOSELOV/UNIV. MANCHESTER

Killer bite Paleontologists unearthed the remains of an ancient, mouse-size mammal that seems to have had a venomous bite (*167: 403**).

Ancient grazers Dinosaur coprolites unearthed in India contained remnants of at least five types of grasses, an indication that grasses evolved diverse forms surprisingly early (*168: 323**).

It's in there The stomach contents of fossils showed that some ancient mammals preyed on young dinosaurs (*167: 36**) and that some types of aquatic reptiles called plesiosaurs were bottom feeders (*168: 285*).

Long line Fossils of a raptor dinosaur suggested that the species' lineage is unexpectedly old and widespread (*168: 243**).

It's all relative DNA analyses hint that the woolly mammoth was more closely related to Asian elephants than to African elephants (*168: 403*).

Groovy bones Remains of an ancient mammal indicated that the characteristic configuration of bones in all living mammals' ears evolved independently at least twice (*167: 100*).

Caribbean extinctions Species of sloths, now extinct, persisted on Caribbean islands until about 4,200 years ago, scientists found, strongly indicating that post–ice-age climate change wasn't the cause of the die-offs (*168: 275*).

Physics

Primordial ooze After more than 20 years of striving to re-create in particle accelerators the fiery gas that was the first matter of the universe, physicists declared victory—but the matter's a liquid not a gas (*167: 259**).

Radioactive planet Telltale flashes in a huge underground tank of baby oil revealed the abundance of the radioactive elements thorium and uranium within Earth (*168: 67**).

On target The correct prediction of the mass of the subatomic B_c meson suggested that theorists could finally use the difficult theory of quarks to calculate real-world effects (*167: 324*).

The violence within Observations of argon-gas bubbles crushed by ultrasound vibrations seemed to confirm suspicions that the light-emitting collapses, known as sonoluminescence, create conditions so hot and brutal that electrons are torn from their atoms (*167: 147**).

Way-back machine A theoretical time-machine design based on normal matter and the vacuum of space boosted the practicality of such machines, compared with prior concepts requiring ingredients not known to exist, such as negative energy (*168: 38**).

Splashes sputter Liquid droplets hitting a hard surface at below-normal air pressures don't splash, high-speed photos revealed. The finding may have implications for ink-jet printing, fuel combustion, and industrial washing and coating processes (*167: 99**).

SKINNIEST MATERIAL
Physicists isolated one-atom-thick sheets of several materials. In an all-carbon version called graphene, electrons moved so fast that they appeared massless, a possible boon for electronics (*168: 110, 309*).

Pentaquacks? Much-ballyhooed elementary particles called pentaquarks may not exist after all, numerous experiments and analyses suggested (*167: 318*).

Slosh-o-matic A quantum mechanical effect predicted 40 years ago—rapid ebbs and flows of ultracold helium-4 liquid through holes between two chambers—finally showed up in an experiment (*167: 142*).

Gait keeper A simple new mathematical model of human locomotion indicated how people's gaits minimize energy use (*168: 182*). Robots based on similar models were found to use less energy and to move more naturally than traditional bipedal robots do (*168: 88**).

High gear A measurement of how fast a rare nickel isotope decays suggested that the universe cranks out heavy elements with

SCIENCE NEWS
Of the year

surprising speed during supernova explosions (*167: 318*).

Ice shock Ultrathin films of water can freeze at room temperature under the influence of electric fields, new data suggested (*168: 131**).

Mighty mite A minuscule plug of microscopic diamond needles, forged in a powerful, hot anvil, took the world title for strongest known material (*168: 189*).

Science & Society

Benched science Analysts indicated that three Supreme Court decisions have greatly limited scientific and medical evidence reaching juries in cases alleging personal injuries (*168: 232**).

Hurricane havoc In the wake of Hurricane Katrina, affected Gulf Coast researchers forged on—many, far from home (*168: 330*).

Conservationists stepped up their efforts to halt the poaching and inhumane farming of bears to supply bile, an ingredient in traditional Asian medicines (*168: 250**).

Drug pushers Studies indicated that pharmaceutical marketing to patients and physicians influences which medicines get prescribed (*168: 75**).

Ethical judgments The National Institutes of Health issued new rules to prevent activities by its employees that might represent conflicts of interest (*167: 108*).

Smoke out An international tobacco-control treaty went into effect in February (*167: 13*).

Shark bait Makers of a controversial and unproved dietary supplement ran afoul of the law—and science—by maintaining that the shark cartilage in their products fights cancer (*167: 154**).

Noble Nobel A *Science News* reporter described the pageantry surrounding the Nobel prize ceremony in Stockholm (*167: 59**).

Technology

Robot scramble Demonstrating a leap in robotic-vehicle proficiency, five unmanned, autonomous vehicles successfully raced through a 210-kilometer course in the Mojave Desert. Last year, no vehicle completed the race (*168: 244**).

Quick study A new type of gene-sequencing machine proved that it can decipher the genetic code up to 100 times as fast as conventional machines can. The novel device processes hundreds of thousands of DNA snippets at a time (*168: 85*).

Tiny tube tech Researchers formed carbon nanotubes into clear, strong, ultrathin sheets that may find uses as lightbulb filaments and solar cell electrodes (*168: 115**). Other new nanotube developments included a high-definition television screen and an X-ray scanner (*167: 342, 349*).

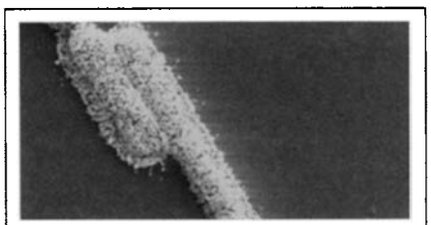
Power walker A new type of backpack converted mechanical energy from up-and-down walking motions into electricity for a cell phone or other portable electronic gadgets (*168: 221**).

Good riddance Scientists showed that prototype fixatives and cleaning agents could pin down or soak up much of the radioactive remains of a dirty bomb (*168: 282**).

On the road Bioengineering and chemistry advances increased the possibility of many cars running on biofuel from agricultural wastes (*168: 218**). Tests of a drag-reducing strategy for big trucks showed potential for saving billions of gallons of diesel fuel annually (*167: 78*).

Mind control Brain-computer interfaces that transmit and interpret neural signals increasingly enabled paralyzed people to interact with computers and operate machines such as mechanical limbs and motorized wheelchairs (*167: 72**).

Space tug Using gravity alone, a massive, unmanned spacecraft could pull an asteroid away from a collision course with Earth, astronaut-scientists proposed (*168: 310**).



Bacteria coated with gold beads functioned as living humidity sensors (*168: 259**).

Mini me Chips with chambers containing living cells mimicked animal and human bodies in tests of drugs and toxic chemicals (167: 24).

Grow your own In a medical first, scientists grew cells into the shape of blood vessels and implanted them into patients (*168: 339**). Following recent strides in dental science, researchers geared up to reproduce whole teeth in coming years (*167: 312*).

SCIENCE NEWS
ONLINE

Food for Thought

Runaway rust A new fungal disease stood poised to hammer wheat yields globally (*sciencenews.org/articles/20050924/food.asp*).

Rogue algae New studies indicated that an alga once thought harmless was responsible for severe food-poisoning outbreaks in people who ate tainted mussels (*sciencenews.org/articles/20050129/food.asp*).

Immersion therapy Slicing fruits and veggies while they're submerged in water proved to keep the produce fresh days longer than when it was cut on a countertop (*sciencenews.org/articles/20050820/food.asp*).

Poor nutrition A demographic study of U.S. residents' weight concluded that the obesity epidemic "is a largely economic issue," with many poor people becoming overweight by eating unhealthy food (*sciencenews.org/articles/20050716/food.asp*).

Vitamin bonus People who got plenty of vitamin D from their diets or the sun were more likely to remain diseasefree after lung-cancer surgery than were people who were D deficient, a study showed (*sciencenews.org/articles/20050423/food.asp*).

Leaden chocolates Scientists tried to puzzle out why chocolates are among the most lead-tainted foods (*sciencenews.org/articles/20051105/food.asp*).

Inflammation-fighting fat An unusual dairy fat modulated the injurious, runaway inflammation that underlies diseases ranging from arthritis to lupus (*sciencenews.org/articles/20051029/food.asp*).

Pet poison A veterinarian triggered an investigation that showed that "pocket pets" such as mice and hamsters—not food—were behind a *Salmonella* outbreak in the United States (*sciencenews.org/articles/20050528/food.asp*).

Organic, but ... Organic produce, especially root crops such as carrots, was found to carry traces of long-banned pesticides (*sciencenews.org/articles/20051126/food.asp*).

TEA TRIMMING
Men who drank oolong tea enriched with compounds that naturally occur in green tea lost weight while those drinking a regular oolong brew didn't (*sciencenews.org/articles/20050212/food.asp*).

Laser diagnosis A new device promised to limit farm costs and environmental pollution by using polarized light to analyze how much fertilizer each crop plant needs and then directing sprayers to dispense only that amount (*sciencenews.org/articles/20050917/food.asp*).

Cancer-fighting beer In tests on lab animals, beer limited the DNA damage triggered by carcinogens that form in overcooked meat (*sciencenews.org/articles/20050305/food.asp*).

MathTrek

Twin primes New developments in characterizing the distribution of prime numbers suggested that mathematicians are nearing a long-sought proof that there are infinitely many pairs of primes that differ by only 2 (*sciencenews.org/articles/20050716/mathtrek.asp*).

Who's first? A new ranking scheme shuffled the national standings of college football teams (*sciencenews.org/articles/20051112/mathtrek.asp*).

Climbing high Mathematicians discovered how water-walking insects manage to scale steep, watery slopes (*sciencenews.org/articles/ 20051105/mathtrek.asp*).

Ask a friend Researchers developed a model showing that paying for answers to questions improves the chances of getting responses from a social network (*sciencenews.org/articles/20051029/mathtrek.asp*).

Space patrol Mathematical insights from atomic physics led to new, energy-saving routes for spacecraft (*sciencenews.org/articles/20050910/mathtrek.asp*).

Pass or fail Computer scientists developed an authentication scheme in which a computer creates a test that it can't pass but most people can (*sciencenews.org/articles/20050416/mathtrek.asp*).

Crash stats A statistical study revealed that the number of fatal car accidents goes up in the hours following a telecast of a Super Bowl (*sciencenews.org/articles/ 20050219/mathtrek.asp*).

Decoded knots Scientists began to untangle mysterious Inca messages encoded in knotted strings (*sciencenews.org/articles/20050820/mathtrek.asp*).

Strange orbits Researchers uncovered further evidence that orbiting bodies can follow weird trajectories, from figure-eight loops to complex, interlocked paths (*sciencenews.org/articles/20050813/mathtrek.asp*).

Getting there A new mathematical model showed that the world's air-transportation network resembles the Internet (*sciencenews.org/articles/20050702/mathtrek.asp*).

Tennis ace The probability of winning a tennis set or match doesn't depend, in theory, on which player serves first (*sciencenews.org/articles/20050611/mathtrek.asp*).

Research rank A physicist developed a formula for characterizing the scientific output of a researcher (*sciencenews.org/articles/20051203/mathtrek.asp*).

SCIENCE NEWS for KIDS

Candid camera An underwater camera snapped the first pictures of a live giant squid (*sciencenewsforkids.org/articles/20051102/Feature1.asp*).

Time change A new law mandated that, to save energy, daylight saving time in the year 2007 will start earlier and end later than it does now (*sciencenewsforkids.org/articles/20051026/Feature1.asp*).

Fog buster Researchers invented a special coating for glass that can prevent misty windows and reduce screen glare (*sciencenewsforkids.org/articles/20051012/Feature1.asp*).

Ice shrinkage New evidence indicated that most glaciers around the world are getting smaller (*sciencenewsforkids.org/articles/20050914/Feature1.asp*).

Walktopus Biologists discovered that some octopuses can walk, using two of their eight arms to scoot backward (*sciencenewsforkids.org/articles/20050831/ Feature1.asp*).

Perfect pops Scientists uncovered why some popcorn kernels stay unpopped in the microwave (*sciencenewsforkids.org/articles/20050504/Feature1.asp*).

Smashing display A space probe slammed into a comet and sent up a mighty cloud of dust (*sciencenewsforkids.org/articles/ 20050824/Feature1.asp*).

Food pyramid New food guidelines emphasized that people should eat more fruits, vegetables, and whole grains (*sciencenewsforkids.org/articles/20050420/Feature1.asp*).

Titan's tune A space probe touched down on an alien but eerily familiar world—Saturn's moon Titan—and sampled its music (*sciencenewsforkids.org/articles/20050216/Feature1.asp*).

Disaster from space A newly revised scale rates the risk that an asteroid may crash into Earth and wipe out life as we know it (*sciencenewsforkids.org/articles/20050518/Feature1.asp*).

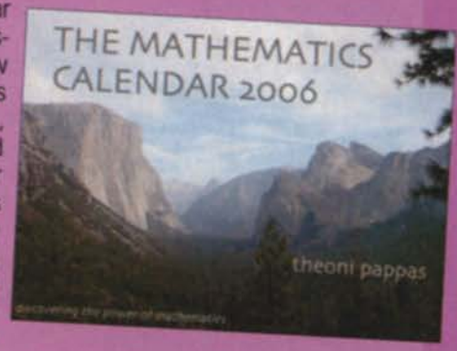
PHOTODISC

Create Math Fun

with a calendar and books from Theoni Pappas

THE MATHEMATICS CALENDAR 2006

Now in its 27th year, with its exciting topics, graphics and mind-boggling problems, this calendar continues to be a hit with teachers, students, engineers, math buffs and puzzle lovers. It's more than a calendar of stories, illustrating how mathematics influences, touches, and impacts our lives. It is uniquely designed so that each day of every month has a problem whose solution is the date. The brain twister lies in figuring how to arrive at the answer. For each month, the problems range from arithmetic to calculus. THE MATHEMATICS CALENDAR has given thousands of people a new perspective about how math can be fun, fascinating and intriguing. It's no wonder its popularity continues to grow.

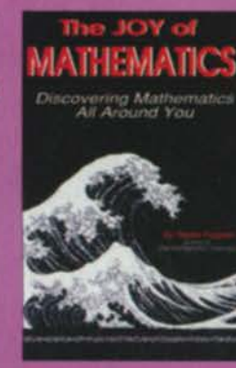


The 12 monthly themes feature exciting topics which remind us again and again how mathematics describes nature, impacts the sciences, is essential to architecture, is inseparable from music, influences the arts, exercises and tantalizes the mind with its puzzles and problems, stimulates and creates new technologies, and reveals the multi-dimensions of our world and universe through its ever-evolving ideas and insights.

—Wide World Publishing/Tetra, 11" x 8 ½", $10.95

THE JOY OF MATHEMATICS

Part of the joy of math is that it's everywhere—in soap bubbles, electricity, da Vinci masterpieces, even on the pool table. This collection of over 200 clearly illustrated puzzles and tips demonstrates mathematical concepts like Fibonacci numbers, probability and magic squares, and shows where they turn up in the "real" world.

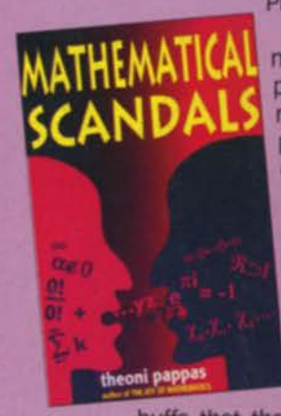


You'll find out what a googol is, invent numerical palindromes and read a thorny problem of logic that was stumping them back in the eighth century. Dive right in and open this book at random, and you'll enjoy such sections as the Paradox of the Unexpected Exam and Lewis Carroll's decidedly Tangled Tale— THE JOY OF MATHEMATICS adds up to the most fun you've had in a long time.

—Wide World Publishing/Tetra, 5 ½" x 8 ½", 242 pages, paperback $10.95

MATHEMATICAL SCANDALS

Might a haberdasher have changed Einstein's life? Why was the first woman mathematician murdered? How come there's no Nobel Prize in Mathematics?



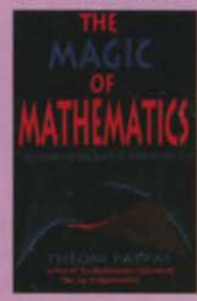
Mathematics is principally about patterns, numbers, equations and solutions, all of them precise and timeless. But behind this arcane matter lies the sometimes sordid world of real people, whose rivalries and deceptions are at odds with the mathematician's reputation for clear thinking and scientific detachment. In this highly readable volume of vignettes of mathematical scandals and gossip, Theoni Pappas assembles 29 fascinating stories of intrigue and the bizarre—in short, the human background of history of mathematics.

MATHEMATICAL SCANDALS appeals to a wide audience. It shows history and math buffs that their interests overlap. It gives math teachers a way to bring their subject to life. And it gives Pappas's devoted fans another dose of the inventiveness and flair they have come to expect from her work.

—Wide World Publishing/Tetra, 5 ½" x 8 ½", 152 pages, paperback $10.95

THE MAGIC OF MATHEMATICS

Delves into the world of ideas, explores the spell mathematics casts on our lives, and helps you discover mathematics where you least expect it. Be spellbound by the mathematical designs found in nature.



Learn how knots may untie the mysteries of life. Be mesmerized by the computer revolution. Discover how the hidden forces of mathematics

- hold architectural structures together —connect your telephone calls
- help airplanes get off the ground — solve the mysteries of the living cell. See how some artists use a mathematical palette in their works and how many writers draw upon the wealth of its ideas.

Experience all this in The Magic of Mathematics.

—Wide World Publishing/Tetra, 5 ½" x 8 ½", 330 pages, paperback $12.95

Wide World Publishing/Tetra PO Box 476, San Carlos, CA 94070

Please send me the item(s) marked below. I include a payment payable to Wide World Publishing/Tetra for the price of the item(s) plus $5.95 postage and handling for the first item. Add $1.50 for postage and handling for each additional item.

_____The Mathematics Calendar, $10.95
_____The Joy of Mathematics, $10.95
_____Mathematical Scandals, $10.95
_____The Magic of Mathematics, $12.95

Name _____ Daytime Phone _____ (used only for problems with order)

Address _____

City _____ State _____ Zip _____

To order by credit card: Card number _____

Exp.Date _____ Signature _____