

NOVEMBER 23, 2002 PAGES 321-336 VOL. 162, NO. 21

# dogs' ancient asian pedigree preventing cervical cancer io's record eruption compassionate neandertals?

www.sciencenews.org



# photo finished? THE RACE TO RECORD VANISHING TECHNIQUES

#### THE WEEKLY NEWSMAGAZINE OF SCIENCE

# SCIENCE NOVEMBER 23, 2002 VOL. 162, NO. 21

#### Features

- **328 Care-Worn Fossils** Bones reopen controversy about ancient assistance by Bruce Bower
- **331 Photography at a Crossroads** In this digital era, the future of historical photos is at stake by Jessica Gorman

#### This Week

- **323 Vaccine could prevent** most cervical cancers by Nathan Seppa
- 323 Satellites tally small asteroid hits by Sid Perkins
- 324 Canine diaspora from East Asia to Americas by Susan Milius
- **324** Domestication gave canines innate insight into human gestures by Carol Marzuola
- 325 Ultracold plutonium compound shows superconductance by Peter Weiss
- 325 Irrigation may worsen Bangladesh's woes by Ben Harder
- 326 Volcanic eruption on Io breaks the record by Ron Cowen
- 326 Immune genes determine outcome of strep infection by John Travis



#### Of Note

333 Gene may keep breast cancer at bayRural living may hobble sperm

#### Meetings

- **334** Mutant mice resist morphine's appeal Scanning a brain that's out
  - of tune
  - Slow brain repair seen in Huntington's
  - Gene change linked to poor memory

#### Departments

#### 335 Books

#### 335 Letters

**Cover** Photographer Hippolyte Bayard appears in one of the first selfphotographs, around 1850. Today, before the secrets become lost in the digital age, researchers are investigating the many chemical processes that have been used to make photographs. (Hulton Archive) Page 331

Visit Science News Online for special features, columns, and references: **www.sciencenews.org** 

#### A SCIENCE SERVICE PUBLICATION

PUBLISHER Donald R. Harless EDITOR Julie Ann Miller MANAGING EDITOR Keith Haglund DESIGN/PRODUCTION DIRECTOR Eric R. Roell PRODUCTION MANAGER Spencer K.C. Norcross ASSOCIATE EDITOR Ivan Amato SENIOR EDITOR/ENVIRONMENT/POLICY Janet Raloff ONLINE EDITOR/MATHEMATICS/COMPUTERS IVARS Peterson BEHAVIORAL SCIENCES Bruce Bower ASTRONOMY Ron Cowen BIOLOGY John Travis BIOMEDICINE Nathan Seppa, Damaris Christensen LIFE SCIENCES Susan Milius PHYSICS/TECHNOLOGY Peter Weiss CHEMISTRY/MATERIALS SCIENCE Jessica Gorman EARTH SCIENCE Sid Perkins ENVIRONMENT/POLICY Ben Harder, John Pickrell MATHEMATICS CORRESPONDENT Erica Klarreich SCIENCE WRITER INTERN Carol Marzuola COPY EDITOR Cindy Allen EDITORIAL ASSISTANT Kelly A. Malcom EDITORIAL SECRETARY Gwendolyn K. Gillespie BOOKS/ADVERTISING Cait Goldberg SUBSCRIPTIONS Christina Smith BUSINESS MANAGER Larry Sigler

#### **BOARD OF TRUSTEES**

CHAIRMAN Dudley Herschbach; VICE CHAIRMAN Robert W. Fri; Secretary David A. Goslin; Treasurer Frederick M. Bernthal; Members Samuel Gubins; J. David Hann; Shirley M. Malcom; Cora Marrett; Eve L. Menger; Mario J. Molina; C. Bradley Moore; Ben Patrusky; Anna C. Roosevelt; Vera Rubin; Willis Harlow Shapley; H. Guyford Stever; Honorary Trustees Edward Bliss Jr.; Bowen C. Dees; Elena O. Nightingale; Gerald F. Tape; John Troan; Deborah P. Wolfe

#### OFFICERS

PRESIDENT DOnald R. Harless 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. Copyright © 2002 by Science Service. Title registered as trademark U.S. and Canadian Patent Offices. Printed in U.S.A. on recycled paper. Republication of any portion of **Science News** without written permission of the publisher is prohibited. For permission to photocopy articles, contact Copyright Clearance Center at 978-750-8400 (phone) or 978-750-4470 (fax).

#### 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.

# SCIENCE NEWS This Week

# Virus Stopper

Vaccine could prevent most cervical cancers

Throughout much of the 20th century, scientists suspected that sexually transmitted infections cause cancer of the cervix. But the culprit remained hidden until 2 decades ago, when scientists isolated human papillomavirus (HPV) DNA from cervical tumors.

That discovery is now paying dividends. In the Nov. 21 *New England Journal of Medicine*, a team of U.S. scientists reports that a vaccine fashioned from an HPV protein protects women from long-term viral infections that can lead to cervical cancer.

"This is an amazing accomplishment," says medical geneticist Robert D. Burk of the Albert Einstein College of Medicine in New York. "It represents what modern molecular genetics can do."

Scientists at Merck Research Laboratories in West Point, Pa., made the vaccine by mass-producing one of two proteins that form a shell around a virus called HPV-16. This virus type is found in roughly half of all cervical tumors. Without viral DNA to accompany it, the protein—called L1—can't cause disease. A safety test on a handful of volunteers confirmed that and indicated that the L1 vaccine primes a person's immune system to make antibodies against HPV-16, says study coauthor Laura A. Koutsky, an epidemiologist at the University of Washington in Seattle.

To test the vaccine's effectiveness in a large group, Koutsky and her colleagues tracked 1,533 women. They were between the ages of 16 and 25, had never had abnormal cervical cell growth show up in a Pap smear, and had blood that tested negative for HPV-16 antibodies. Half received three injections of the vaccine over 6 months, while the others got shots of an inert substance.

Since their injections, the women have undergone periodic health tests including Pap smears. After an average of 17 months, none of the women receiving the vaccine tested positive for HPV-16, but 41 of the



LOOK UP This week's Leonid meteor shower peppered the sky with small fireballs.

women getting the placebo did. During this follow-up period, nine women showed abnormal cell growth on their cervices. They were all in the group that received placebo injections. Such cell growth is sometimes precancerous.

Women receiving the vaccine had 59 times as much antibody against HPV-16 in their blood as did women who had HPV-16 infections at the initial screening for study participation.

Responsible for roughly 250,000 worldwide deaths every year, cervical cancer kills more women than any other cancer in developing countries where Pap smears are infrequent. In contrast, it's only the 12th-mostlethal malignancy in U.S. women because most cases are detected and treated.

There are more than 60 types of HPV, at least 20 of which are linked to cervical cancer. After HPV-16, the most common type found in tumors is HPV-18. Some other HPV types, notably HPV-6 and -11, cause genital warts but haven't been linked to cancer. Merck is developing a vaccine that would combine proteins from these four types. The company plans to test the vaccine in women and men because both can get genital warts and spread the cancercausing HPV types. —N. SEPPA

#### **Bursting in Air** Satellites tally small asteroid hits

**Once a millennium, on average, a small** asteroid slams into Earth's atmosphere and explodes with the energy of 1,000 Hiroshima-size blasts. That's less than one-third as often as scientists previously supposed.

The new estimate stems from observations of fireballs from extraterrestrial objects of a certain size that burned up in Earth's atmosphere between February 1994 and September 2002. During that period, U.S.-satellite sensors detected about 300 such fireballs, says Douglas O. ReVelle, an atmospheric scientist at Los Alamos (N.M.) National Laboratory.

The duration and brightness of each fireball's flash indicates the energy of the accompanying explosion, says Peter G. Brown, an astronomer at the University of Western Ontario in London, Ontario. The stony objects generating the fireballs probably ranged from 1 to 10 meters in diameter, says Brown. That's much larger than the dust grains that vaporize in the atmosphere to form most shooting stars, or meteors, but not large enough to crater Earth's crust.

In the Nov. 21 *Nature*, ReVelle, Brown, and their colleagues report the first comprehensive analysis of impacts of intermediate-size objects. Much of the study's data was gathered by Department of Defense and Department of Energy satellites, which are designed to look for nuclear explosions and other military activities. The most satisfying aspect of the new analysis is that it bridges the previous data gap between meteor-forming pebbles and objects large enough to be observed in space by telescopes, says Robert Jedicke, a planetary astronomer at the University of Arizona in Tucson.

From their analysis, the scientists say, chances are that once each year, a 4-meterwide asteroid will burst in Earth's atmosphere and produce an explosion of about 5 kilotons of TNT—about one-third the size of the Hiroshima blast. Once a decade, on average, the impact of an object 9 m across produces the energy of a 50-kiloton bomb. Actual impact rates may be higher, say the researchers, because the current study spans only 8 years and may not be representative of longer periods.

The new analysis suggests that only once in a millennium is there an atmospheric blast that rivals the one that took place high over Siberia on June 30, 1908. That explo-



sion, estimated to have equaled the energy released by detonating 10 million tons of TNT, leveled about 2,000 square kilometers of remote Russian forest. If it had occurred over a densely populated metropolitan area, the same blast could have killed millions. —S. PERKINS

**Three Dog Eves** Canine diaspora from East Asia to Americas

Two genetic studies have just rewritten the history of humanity's best friend. The new version has moved the origins of the domestic dog from the Middle East to East Asia and argues that the first people to venture into the Americas brought their dogs with them.

Analysis of 654 dogs from around the world suggests that their earliest female ancestors originated from several lineages of wolves primarily in one region, says Peter Savolainen of the Royal Institute of Technology in Stockholm. The patterns of genetic diversity point to East Asia as the likeliest place for the canine Eden, Savolainen and his colleagues argue in the Nov. 22 *Science*.

"This has been the search for the dog Eve," says Savolainen.

The same issue of *Science* also reports on extraction of bits of DNA from New World–dog remains predating European influence. This DNA shows that early New



**OUT OF ASIA** Even an all-American pal has a pedigree stretching back to the Old World.

Worlders did not domesticate dogs anew, say Jennifer Leonard of the Smithsonian Institution in Washington, D.C., and her colleagues.

"The first Americans came across the Bering land bridge with their dogs, and this was something we couldn't prove before," says coauthor Robert K. Wayne of the University of California, Los Angeles.

Dogs were probably the first domesticated animals (*SN: 6/28/97, p. 400*) and have unusual sensitivity to signals from people (*see box below*).

Savolainen started studying dog genetics to help crime-scene investigators analyze hairs. "I've been to a lot of dog shows here, snatching hairs from the dogs," he says.

As he assembled a large collection of dog hairs and attached cells, he began to wonder whether he could expand it and find the cradle of the domestic dog.

He and his international partners focused on stretches of DNA from the cells' mitochondria, or powerhouses, which pass from mother to pup. Based on similarities in that genetic material, 95 percent of the dogs that the researchers had sampled come from just three lineages that seem to have arisen in East Asia, Savolainen and his colleagues say.

To study New World dogs, Leonard and her colleagues worked with DNA from remains up to 1,400 years old. Thirty-seven

## **Dog Sense** Domestication gave canines innate insight into human gestures

A nybody who's ever moved a muscle toward a leash will agree that dogs understand human body language. The animals' capacity to do this, suggests new research, was evolutionarily engrained since they became people's canine companion about 15,000 years ago.

Previous studies have shown that dogs can use human cues to find hidden food. For example, dogs that watch experimenters look or point at a sealed bowl enclosing a meal then choose correctly between that container and an empty one. "Conventional wisdom would say that [people] train dogs to do this," explains Michael Tomasello, a comparative psychologist at the Max Planck Institute in Leipzig, Germany. But his team's findings support another view.

Tomasello and his colleagues compared various animals taking the food-container challenge. Dogs were always better than human-reared wolves at finding the food. And they even outwitted chimpanzees. The research team was surprised to find that 9-to-26-week-old puppies, including some rarely exposed to people, could use the researchers' cues to find food.

In the Nov. 22 Science, the researchers conclude that dogs don't learn social and communication skills from people nor do they inherit them from wolves, their closest relatives. They acquired the skills as they evolved in domestication (see story above). Mark Plonsky of the University of Wisconsin–Stevens Point disagrees. He suggests that all the dogs in the study could have learned the skills. Even the puppies were old enough to have learned them from their mothers and littermates, he says.

In contrast, Benjamin Hart of the University of California, Davis says that dogs might learn from experience but that "they're also predisposed genetically" to understand people's cues. —C. MARZUOLA

ROELL

came from archaeological sites in Peru, Bolivia, and Mexico, and 11, from modern gold mines in the Alaskan permafrost.

When the researchers constructed a family tree that includes modern dogs and wolves, they found that the ancient New World dogs were much closer to Old World dogs than to New World wolves. Also, the ancient New World lineages seem to have disappeared from modern breeds.

The two new studies agree with suggestions from older work: Dogs were domesticated in the Old World, and the earliest migrants brought them to the New World, comments geneticist David Hillis of the University of Texas at Austin. He is convinced by the new data that the major lineages of dogs originated in East Asia, but he sees evidence in the Savolainen study that some rarer lineages evolved elsewhere. -S. MILIUS

## **Cold War** Conductor

Ultracold plutonium compound shows no resistance

Researchers studying the crystalline structure of radioactive plutonium have happened onto the first plutonium-based superconductor. Like other superconductors, this one carries electricity with zero resistance, but it doesn't fit neatly into any known family of superconducting substances.

Plutonium, the explosive heart of most nuclear weapons, is too radioactive and toxic for the find to lead to any practical applications. But the puzzling new alloy is opening a route to studying some poorly understood aspects of superconductivity, says John L. Sarrao of Los Alamos (N.M.) National Laboratory, who led the experiment.

The path to the new superconductor traces back to an obscure scientific question from the Manhattan Project. Scientists making the first nuclear weapons found that when they heated plutonium, they could transform its brittle, room-temperature form into a ductile, so-called delta phase that was more easily machined into weapons parts. Moreover, by adding a little gallium to the hot material, they could get this favorable structure to persist even after the alloy cooled to room temperature. However, no one ever figured out gallium's action.

To investigate this puzzle, Sarrao and his Los Alamos coworkers created a new material that's structurally related to delta-phase plutonium. They blended and heated plutonium with gallium and cobalt and then slowly cooled the molten mixture. To the scientists' surprise, tests showed that the resulting compound is a superconductor at cryogenic temperatures below 18.5 kelvins.

A material becomes a superconductor when its free-roaming electrons, which ordinarily repel each other, form pairs that

can zip through the material's crystal lattice unimpeded (SN: 9/7/02, p. 158). In conventional superconductors, atomic vibrations induce the electron pairing. Most of these materials need to be chilled below 20 K before they shed electrical resistance.

In a class of superconductors that's less well understood, the electron-pairing mechanism remains obscure. Some copper-oxide-based members of this class retain their superconductivity at temperatures as high as 160 K, about as warm as the coldest terrestrial temperature ever recorded

outside a laboratory. Other members lose their electrical resistance only within a couple degrees of absolute zero. The new material resembles these in structure and some magnetic and electrical properties, Sarrao's team reports.

The new plutonium-gallium-cobalt material could be a missing link within this second class of superconductors because it loses electrical resistance at an intermediate temperature, Sarrao says. If further studies of the new compound's properties confirm it as a member of this class, they may also shed light on the electron-pairing mechanism that renders these materials superconductive, he adds.

Sarrao and his colleagues from Los Alamos, the University of Florida in Gainesville, and the European Commission's Institute for Transuranium Elements in Karlsruhe, Germany, describe the new superconductor in the Nov. 21 Nature. -P. WEISS

## Arsenic **Agriculture?**

Irrigation may worsen Bangladesh's woes

Researchers investigating an unfolding, massive epidemic of arsenic poisoning in Bangladesh say they have evidence that local irrigation practices may be contributing to the problem.

Charles F. Harvey of the Massachusetts Institute of Technology and his colleagues now posit that pumping water for irrigation alters the flow of subterranean water

in ways that draw naturally occurring arsenic into aquifers.

But other researchers investigating the region's geology argue that the new finding supports only a limited culpability for irri-

gation. They point their

fingers instead at buried

peat deposits, which they

say foster chemical reac-

tions that introduce the

arsenic into aquifers. Offi-

cials need to know the

process behind the poi-

soning to minimize the

The people of Bangla-

desh depend on millions

of wells dug since 1970

for irrigation and drink-

ing water. Years into the

flurry of construction,

scientists discovered that

many of the wells con-

tain toxic concentrations

of arsenic, which can

cause various cancers

and other health prob-

health impacts.

**BAD WATER** Red paint on this well's spigot indicates that the water is tainted with arsenic.

lems (SN: 4/6/02, p. 214). Seventy-seven million Bangladeshis are either sick from or considered at high risk for arsenicrelated diseases.

To explore whether the expanding practice of irrigation since the 1970s is related to arsenic contamination, Harvey and his colleagues drilled 17 new wells-ranging in depth from 5 to 165 meters—on a small plot in central Bangladesh. They measured the arsenic and other substances in water and sediment extracted from cores bored into the plot. Concentrations of both arsenic and dissolved organic-carbon compounds increased with depth in the wells and reached peaks at 30 to 40 m, the researchers report in the Nov. 22 Science.

The scientists also injected different fluids into the ground and found that molasses, which is rich in organic-carbon, rapidly increased arsenic concentrations in the test wells. Harvey's team suggests that organic carbon feeds chemical reactions that liberate arsenic from minerals in the soil. The poison then dissolves in water and migrates into aquifers.

Pumping of well water for irrigation in the past few decades has accelerated the speed at which carbon-rich surface water moves downward to replenish aquifers, the researchers argue. They estimate that it may take as little as 7 years for pumping to draw dissolved organic carbon down to a depth of 30 m, deep enough to enter aquifer systems.

Although the study makes "a very valuable contribution," says Peter Ravenscroft of Cambridge, England, he's not convinced that arsenic enters aquifers only when surface water percolates rapidly downward. That model doesn't explain why arsenic is a severe





problem in parts of the country where irrigation is uncommon, says Ravenscroft, a long-time water geologist in Bangladesh.

Meanwhile, he and John M. McArthur of University College London argue that buried deposits of peat may better account for the overall pattern of arsenic poisoning. If organic carbon from irrigation were as important as Harvey's group suggests, then it should be most concentrated at the surface, McArthur says. Peat deposits, he points out, often are found at depths of 30 to 40 m, just where Harvey's group detected the highest arsenic concentrations.

Harvey notes that the plot his team studied may not be representative of all affected areas. So, despite his team's findings, he cautions against hasty changes in irrigation practices. —B. HARDER

# Leapin' Lava!

Volcanic eruption on Io breaks the record

Within hours of erupting, the volcano shot fountains of lava high into the atmosphere and dumped molten rock over a region larger than London. The cataclysmic event, which occurred last year on Jupiter's moon Io, ranks as the most powerful volcanic eruption ever recorded in the solar system.

The enormous tidal forces exerted by Jupiter's gravity relentlessly flex Io and heat it up, making it volcanically active. The moon may experience a dozen or so massive eruptions each year. Even so, planetary scientists were surprised when one of Io's volcanoes pulled off the record-breaking eruption. The event, which took place on Feb. 22, 2001, was twice as powerful as any other eruption observed on the Jovian satellite. Researchers report their observations in the November *Icarus*, a planetary science journal.

Although the Galileo spacecraft has been touring Jupiter, Io, and Jupiter's three other large moons since 1995, the craft has only made short visits to Io's vicinity. So it was an Earth-based telescope, the Keck II on Hawaii's Mauna Kea, that spotted the eruption. On Feb. 20, 2001, the moon appeared relatively quiet. But 2 days later, a small hot spot on the surface, near a volcano called Surt, had ballooned in size.

"We were lucky enough to detect the beginning of an outburst," says planetary scientist Imke de Pater of the University of California, Berkeley. She, her Berkeley colleague Franck Marchis, and their collaborators estimate that the heat from the eruption nearly equaled the heat emitted by all the rest of the moon's surface. That estimate, based on near-infrared observations from Keck, represents only a lower limit to the volcano's energy output, Marchis notes.

Surt lies about 45° N of Io's equator. That

jibes with a volcanism model in which the most powerful eruptions on that moon take place at high latitude, says John Spencer of Lowell Observatory in Flagstaff, Ariz. The model suggests that the moon's crust may be thicker there or the lava that emerges may be pastier. Either fea-



**OVER THE TOP** The most powerful volcanic

eruption ever recorded in the solar system.

successively longer infrared wavelengths,

Images, from left to right taken with

near the equator, Spencer says. Material from the record-breaking eruption appears to cover 1,900 square kilometers, an area about a thousand times the dominion of Italy's Mount Etna, one of Earth's most active volcanoes. The temperature of the lava, about 1,500 kelvins, is similar to that of the hottest volcanoes on Earth.

Astronomers credit the Keck telescope's adaptive optics with its success at pinpointing the Io eruption. In Keck's optics, segments of a mirror flex fast enough to compensate for the blurring caused by turbulence in Earth's atmosphere. With the Galileo mission drawing to an end, "ground-based telescopes equipped with adaptive optics are the best tool for monitoring volcanic activity on Io," says Marchis. —R. COWEN

#### **Life or Death** Immune genes determine outcome of strep infection

Think of it as Russian roulette with a bacterium instead of a gun. Most people infected with group A streptococcal bacteria notice no symptoms or simply develop a sore throat. Sometimes, however, a strep infection erupts into a life-threatening illness, causing failure of several organs and shock. On even rarer occasions, the infection devours a person's flesh at a remarkable rate.

Subtle variations among people's immune genes may largely account for the radically different outcomes, according to an international team of researchers led by Malak Kotb of the University of Tennessee in Memphis. Curiously, the immune-gene types that produce the strongest reaction to the strep A bacteria seem to also predispose people to the most-severe disease.

The scientists focused on genes encoding cell-surface proteins called human leukocyte antigens (HLAs). On certain immune system cells, these molecules present bits of microbes to other immune cells and prod them to respond. People have evolved many different forms of HLAs, making individ-

uals more or less susceptible to various infections.

In the case of strep A infections, the bacterium secretes toxic proteins called superantigens that bind to HLAs. The superantigens seem to overstimulate the immune system and thereby prevent an effective tailored response to the bac-

As reported in an upcoming *Nature Medicine*, Kotb's team examined the HLA genes of two groups, each of more than 250 people. The participants in one group had strep A infections of varying severity and in the other group, were healthy and uninfected.

The researchers found that certain combinations of HLA-gene variants were underrepresented or overrepresented in various patient categories. From those data the team pinpointed a combination of two variants that seems to protect people with strep A infections from developing organ failure and shock. The scientists also identified a pair of variants that appears to make people more susceptible to an organ-damaging infection. Finally, the researchers detected a pair of variants that protects people from the flesh-eating symptoms of strep A infections but not organ failure.

Kotb and her colleagues also exposed white blood cells from their volunteers to the superantigens produced by strep A. The blood cells of people with HLA genes that protect against organ failure responded less strongly than did the cells of people with HLA genes that increase the risk of a lifethreatening strep A infection.

This indicates that a body's exaggerated immune response, a flood of cells and inflammatory chemicals, causes the most dangerous symptoms of strep A infection. "The host is actually harming itself," says Kotb.

Because a medical test can determine the HLA type of a person in just an hour, physicians may someday routinely use HLA type to decide how aggressively to treat a person with strep A infection.

Victor Nizet of the University of California, San Diego says that the new findings also set the stage for identifying exactly which strep A superantigens trigger disease, results that may lead to new drugs or a vaccine. —J. TRAVIS

SCIENCE NEWS

# **CARE-WORN FOSSILS**

Bones reopen controversy about ancient assistance

BY BRUCE BOWER

elcome to a messy tale of survival in the face of daunting physical challenges. Its protagonists include a nearly toothless adult of indeterminate sex, a man with a withered arm and one blind eye, a teenage dwarf, and a bunch of apes. No, it's not a screenplay for the next David Lynch movie—at least, not yet. It's a scientific inquiry into whether fossils of physically impaired individuals show that our ancient ancestors had a soft spot for the injured and infirm.

The latest chapter in this Stone Age saga began last year with

a much-publicized report of a partial Neandertal jaw missing many of its teeth and marred by extensive bone damage (SN: 9/15/01, p. 167). The newly discovered specimen, dated at between 169,000 and 191,000 years old, came from a man or woman who must have endured a mouthful of pain and was unable to chew food for at least 6 months, concluded coauthors Serge Lebel of the University of Quebec in Montreal and Erik Trinkaus of Washington University in St. Louis.

This person's survival hinged on having a support

system, the researchers theorized. Neandertal comrades supplied fruit and other soft foods to him or her, and they probably pounded or cooked tougher fare—meat, in particular—so that it could be swallowed without chewing.

Not everyone who stares into the jaw, which was discovered in France, or examines other disfigured human fossils sees signs of prehistoric compassion, though. Lebel and Trinkaus ignored critical evidence that undermines their conclusion, contends David DeGusta, a doctoral student in anthropology at the University of California, Berkeley.

He has examined published reports of relatively recent wild monkeys and apes that exhibit as much or more tooth loss and bone disease as that reported for the French Neandertal find, he says. Skeletal scrutiny also indicates that these animals can survive a range of illnesses and injuries that cause permanent disabilities.

Such data haven't fueled any arguments that healthy monkeys and apes keep their disabled peers alive or to make their lives easier. Neither can such evidence be used as a signature of social support among Stone Age folk, DeGusta concludes in the December *Journal of Archaeological Science*.

"The French jaw doesn't provide any evidence of increased Neandertal caregiving relative to nonhuman primates," he says. "This fossil individual could just as easily have provided or processed his or her food without help from others."

DeGusta, Trinkaus, and other scientists are re-examining data and specimens collected over the last century to try to clear up how Stone Age folk treated their weakened comrades.

**ANCESTRAL AID** The French jaw, found at the Bau de l'Aubesier rock shelter and dubbed Aubesier 11, joins several other debilitated Stone Age individuals often regarded as recipients of social assistance. The French jaw represents the earliest evi-

dence of caring for the disabled by our fossil ancestors, according to Lebel and Trinkaus. It also fits with broader attempts by some anthropologists to portray Neandertals as the cultural equals of modern people (*SN: 12/15/01, p. 380*).

"This is one more piece of the puzzle indicating that some type of social support occurred among Neandertals," Trinkaus says.

The most prominent case of Neandertal physical impairment is an adult male whose skeleton was found more than 30 years ago at Iraq's Shanidar Cave.

Trinkaus' 1983 analysis indicated that the Shanidar man, who lived about 50,000 years ago, suffered many bone fractures and extensive arthritic damage to his joints. His withered right arm had been paralyzed, and damage to his left eye had probably left it blind.

Moreover, several Neandertals who inhabited Croatia's Krapina Cave around 130,000 years ago sustained skull fractures that would have knocked them unconscious and required life-saving aid from others for at least a few days, says Janet Monge of the University of Pennsylvania in Philadelphia. Monge and Princeton University anthropologist Alan Mann discovered the injuries when they recently took X rays of more than 800 Krapina fossils belonging to several dozen Neandertals.

Monge suspects that the Krapina Neandertals sustained skull fractures from pieces of the cave's roof falling on their heads. Other researchers think that the head injuries resulted from fights using clubs or other weapons.

Some Krapina cave dwellers also lived with considerable tooth loss. It's hard to know whether these individuals got special care



DENTAL FLAWS — This nearly toothless, diseased Neandertal jaw, dis-

covered in France, has stirred up debate over Stone Age social care.

from others, Monge holds. Some people today adapt to the pain of untreated dental disease and manage on their own, while others don't. Jawbones can't reveal telltale signs of either resilience or misery.

Neandertals weren't the only human ancestors that survived physical disabilities. Consider three separately discovered archaic *Homo sapiens* fossils dating to around 150,000 years ago. One individual grew to adulthood despite an inborn misalignment of head and neck, another tottered around on a misshapen hip, and a third had bony growths in the inner ear that would have interfered with balance and walking. The discoverers of these fossil individuals have assumed that they must have benefited from some type of social assistance.

An even more curious case

involved the Romito boy, an 11,000-year-old human skeleton that was excavated in an Italian cave nearly 40 years ago. This 3-1/2-foot-tall individual, about 17 years old at the time of his death, experienced a severe growth deficiency and limited mobility, according to a 1987 study directed by anthropologist David W. Frayer of the University of Kansas in Lawrence. Comrades must have taken pains to feed the diminutive teen and bring him along on periodic moves through the area's rugged environment, Frayer's group concluded.

Nearly toothless, diseased jaws also appear in the skeletal remains of hunter-gatherers who lived in parts of North America several thousand years ago, according to research directed by anthropologist Clark S. Larsen of Ohio State University in Columbus. In his view, however, there's no evi-



**LOST BITE** — An adult spider monkey skull, which belonged to an animal that died in the wild, displays massive tooth loss. Bone growth around tooth sockets indicates that the monkey survived at least 6 months without its teeth, according to Berkeley's David DeGusta.

dence that these individuals—or the Aubesier Neandertal received special care from their comrades.

Another anthropologist who studies Stone Age *Homo* species disagrees. Although it's hard to squeeze prehistoric behavior out of fossils, Lebel and Trinkaus "are on to something," remarks Karen Rosenberg of the University of Delaware in Newark.

Fossil evidence including the Aubesier jaw suggests that, beginning with Neandertals, social assistance of some kind enabled physically impaired individuals to survive longer than they could have in earlier species, such as *Homo erectus*, Rosenberg asserts.

**APING HUMAN INJURIES** "It's really reaching to interpret [the Aubesier] fossil's condition as a sign of social care among Neandertals," contends Berkeley anthropologist F. Clark Howell, DeGusta's academic advisor. He and DeGusta wondered whether apes, which anthropologists generally agree don't take care of injured companions, survive after similarly serious wounds.

Although DeGusta found that relatively few researchers have probed skeletal markers of disease and injury in nonhuman primates, he located several published instances of these creatures having lived with extensive tooth loss and bone-decaying oral ailments. These reports described recently deceased animals.

One of the most thorough investigations of primate skeletons occurred decades ago. In 1956, primatologist Adolph Schultz wrote that "the misnamed permanent dentition" frequently falls

DEGI

out or becomes unusable because of disease in apes and monkeys, as well as in people. Schultz noted that several freshly killed chimpanzees showed evidence of having survived for months and possibly years after the loss of the majority of their teeth.

DeGusta also located a 1936 investigation by another scientist that noted near-total tooth loss in a chimp and a monkey that had lived into old age in the wild.

Studies conducted more recently have found that nonhuman primates sometimes survive not only extensive tooth loss but also illnesses such as hepatitis, malaria, and poliomyelitis, DeGusta says.

They also endure a surprising number of injuries from guns. In 1993, anthropologist Bruce Latimer X-rayed chimp, gorilla, and

orangutan skeletons held at the Cleveland Museum of Natural History. He determined that about 12 percent of injuries originally classified as naturally occurring fractures were instead healed gunshot wounds. These creatures had endured types of injuries that routinely put people in the hospital and sometimes prove fatal, Latimer says.

"Even a cursory examination of great ape skeletons demonstrates that these animals have a remarkable ability to survive trauma and infection," he holds.

The physical resilience of apes also casts a shadow over attempts to portray skeletal disease, such as that on the French Neandertal jaw, as a marker of social care. "I have no doubt that Neandertals had a sophisticated culture and social structure, but dental [disease] is not evidence of it," Latimer contends.

That hardly settles the issue. Lebel and Trinkaus defend their position in an upcoming *Journal* 

of Human Evolution.

Wild apes and monkeys have yet to provide any evidence of having lived for long periods with as much tooth loss as that observed on the French Neandertal jaw, the researchers assert. Most of the apes and monkeys in the studies that Lebel and Trinkaus have considered had lost fewer than 60 percent of their teeth. Those who survived the most extensive tooth loss lived in the tropics where they ate soft plants, a far more congenial diet than Neandertals' meat-laden menu, the researchers maintain.

Field observations of baboons and ring-tailed lemurs indicate that individuals that lose most or all of their teeth soon die or disappear from their groups, Trinkaus adds.

**HANDICAPPING BONES** The Aubesier jaw inspires a frustrated sense of déjà vu in Katherine A. Dettwyler. "Oh, brother," she says, "will people never learn?"

Dettwyler, an anthropologist who now works at the American Philosophical Association in Newark, Del., wrote a 1991 paper that challenged fossil-fueled scenarios of compassionate Stone Age caregivers. She says that the newer evidence doesn't change her position.

In her 1991 piece, she took special aim at scientists' interpretation of the Shanidar skeleton. This individual may not have been a good hunter, but he could have collected plants, processed and cooked food, and performed many other daily activities, Dettwyler argued. If loss of sight in one eye occurred after adulthood, the Shanidar Neandertal could have adjusted relatively easily to a narrower visual field, she added.

Dettwyler also challenged the conclusion that the Romito boy must have been helped along on his people's strenuous treks. Dettwyler notes that in some African hunter-gatherer groups, children as young as 5 years old walk with their mothers on long food-gathering trips. The Romito boy probably didn't march at the head of a traveling band, but he could have straggled along on his own. It's also possible that migrating group members left the Romito boy behind, and he then tracked them down at

his own pace. There's no way to know from his bones, Dettwyler says.

Frayer has now reversed course and agrees with Dettwyler. Because apes and monkeys show so many skeletal signs of surviving major illnesses and injuries, it's dangerous to assume that the Romito boy or any other fossil ancestor displaying a physical disability benefited from special care, Frayer contends.

"A lot of researchers, including me, have been guilty of jumping to conclusions from fossil evidence about ancient caring behaviors," he says.

As the mother of a child with Down's

syndrome, Dettwyler has a personal stake in this debate. Researchers who study the Stone Age and draw lessons about ancient social care from fossils rely on a handful of inaccurate beliefs about disabilities in modern societies, she says.

First, scientists assume that nonproductive individuals are rare and hard to incorporate into most societies. Instead, human groups have much experience caring for needy individuals. These include babies, children, and women in the final stages of pregnancy and the weeks after giving birth.

Second, the notion that bones inevitably tell the story of a person's disabilities is belied by cases of blindness, deafness, mental retardation, and other impairments that don't always affect the skeleton.

Third, people with physical disabilities often live without others' assistance. In Mali, where Dettwyler has conducted fieldwork, many people develop disabilities from polio, leprosy, or untreated injuries. Yet these individuals can hold respected jobs, including caring for their relatives' children, spinning cotton, and serving as traditional healers.

On the other side of the coin, even modern people who survive physical impairments haven't necessarily been treated kindly. In Mali, Dettwyler observed some disabled individuals routinely beaten and jeered and children with crippling polio crawling to school. "The [fossil] record can't tell us whether disabled persons were treated with compassion, tolerance, or cruelty," Dettwyler says.

SKELETON KEYS At this point, the fossil record contains just enough to keep the scientific debate about prehistoric social support simmering at a slow boil.

If skeletal keys can conclusively unlock Stone Age behavior toward the disabled, they have yet to be found, remarks anthropologist Della C. Cook of Indiana University in Bloomington. Cook studies signs of disease in skeletal remains of people who lived between around 10,000 and 5,000 years ago.

The Aubesier jaw represents a classic example of skeletal ambiguity, she says. Lebel and Trinkaus make an "interesting and persuasive" case for Neandertal social support, according to Cook. However, she notes, DeGusta provides a "useful critique" that, of necessity, relies on a small number of ape and monkey studies.

"I'm not convinced by either argument," Cook says. "We need far more data than we're likely to have anytime soon to resolve this issue." ■

o you wish you understood the science of food, but don't want to plow through dry, technical books? What Einstein Told His Cook is like having a scientist at your side to answer your questions in plain, nontechnical language.

"We need

far more

data than

to have

anytime

soon to

issue."

we're likely

resolve this

Chemistry professor and syndicated Washington Post food columnist Robert L. Wolke provides more than100 reliable and witty explanations, while debunking misconceptions and helping you interpret confusing advertising and labeling. Here are some of the things you will learn.

IN "TURF AND SURF": Why red meat is red. How to deal with a live clam, oyster, crab, or lobster. IN "LIQUID REFRESHMENT": Why your coffee tastes like acid. How coffee is decaffeinated.

> IN "THE SALT OF THE EARTH": That your "sea salt" may have come from a mine. Why we salt water for boiling pasta. How you can remove excess salt from your soup.

IN "CHEMICALS IN THE KITCHEN": What's in tap water. How baking powder and baking soda differ. What MSG does to food.

IN "THE FAT OF THE LAND": The difference between a fat and a fatty acid. What makes a fat saturated or unsaturated.

IN "SWEET TALK": That roads can be paved with molasses. Why cooked foods turn brown. What we owe Christopher Columbus' mother-inlaw. That starch is made of sugar.

IN "THOSE MYSTERIOUS MICROWAVES": What microwaves do-and don't do-to your food. What makes a "microwave

IN "TOOLS AND TECHNOLO-GY": Why nothing sticks to nonstick cookware. That pressure cookers are safe. You really can cook with light.

safe" container.

IN "FIRE AND ICE": How you should compare kitchen ranges. What's better for grilling: charcoal or gas.

-from W.W. Norton

ORDER BY PHONE FOR FASTER SERVICE! 1-800-370-3010 VISA, MASTERCARD, OR AMERICAN EXPRESS SEE OUR WEB SITE AT WWW.SCIENCENEWSBOOKS.ORG A SERVICE OF SCIENCE NEWS BOOKS

**HowToMedia** 28 SLOCUM PL., LONG BRANCH, NJ 07740 \_copy(ies) of What Einstein Told His Cook. Please send me I include a check payable to How To Media for \$25.95 plus \$5.95 postage and handling for the first book (total \$31.90). Add \$2.50 for postage and handling for each additional book.

Name Address State City Daytime Phone \_\_\_\_\_(used only for problems with order)

WHAT EINSTEIN TOLD HIS COOK WW Norton, 2002, 350 pages 6¾" x 9¾", hardcover, \$25.95



SCIENCE NEWS

# PHOTOGRAPHY AT A CROSSROADS

## In this digital era, the future of historical photos is at stake

BY JESSICA GORMAN

ne summer day in 1826, Joseph Nicéphore Niépce placed a metal plate inside a black box in a sunny window at Le Gras, his country estate in the south of France. After 8 hours, Niépce found that with his primitive camera, he'd achieved a goal that he'd been striving after for years: He'd produced a permanent image recorded onto a photosensitive medium. It was the first successful example of "fixing permanently the image from Nature," Niépce told members of the Royal Society when he traveled to England in 1827. However, when Niépce presented his invention, he wouldn't fully divulge his process, and the society failed to confirm his discovery.

Today, it's known that Niépce coated his plate with an asphalt called bitumen of Judea, which hardened under long exposure to the

sun's rays. He then washed the unhardened material from the plate with a mixture of oil of lavender and white petroleum, leaving the faint image of his courtyard in relief. Nonetheless, the fine details of this process died with Niépce in 1833.

Such murkiness is rampant in the history of photography. In the almost 180 years since Niépce made the world's first photograph, inventors, artists, and photographers have used 150 or so chemical processes to create prints, says Dusan Stulik of the Getty Conservation Institute in Los Angeles. For many of these processes, no detailed technical account is available.

This problem is more than just a headache for historians interested

in technological minutiae. Such knowledge is critical to the care and display of culturally, artistically, and historically important photographs.

That's why Stulik and his colleagues have taken up the mission of unveiling the chemical mysteries of the first photograph, as well as those that followed it. With the accelerating pace of digital photography (see box, page 332), documenting the obsolete processes used to make these photos has taken on a new urgency. This information could soon be gone, as those who still understand photographic processes die off along with the industry that supported them.

"This is the tremendous pivot point in the history of imaging," says Jim Reilly of the Image Permanence Institute (IPI) in Rochester, N.Y.

New information that researchers have just revealed about Niépce's "View from the Window at Le Gras" bodes well for their uncovering the secrets behind other early photographs. **A PHOTO'S JOURNEY** Niépce's famous photo has been on quite an adventure. On leaving England in 1828, Niépce placed the framed 16-by-20-centimeter image—or heliograph, as he called it in the care of a friend, Francis Bauer, a botanical illustrator at London's Kew Gardens. After Bauer's death in 1841, the heliograph passed from one person to another.

More than a century later, photo historian and collector Helmut Gernsheim began a quest to find the photo. After 2 years of sleuthing, he traced its most recent purchase, in 1884, to the Pritchard family in London. Unfortunately, none of the Pritchard family members seemed to know exactly what had happened to the framed metal plate. Then, in 1952, Gernsheim received a letter from a Pritchard family member who had cleaned out a trunk that had been sealed since 1918. She had found what looked like a framed, tarnished mirror. It might be the lost photograph, she wrote, but unfortunately, the image of Le Gras appeared to have faded away.

Gernsheim rushed to London, where he discovered that the tar-

nished mirror indeed was Niépce's heliograph. Even better, the image had not faded away. It had always been faint. To make it stand out, Gernsheim just needed to turn the plate this way and that in the light.

The woman gave Gernsheim the silver-gray plate, along with a document detailing Niépce's presentation to the Royal Society. A decade later, Gernsheim donated the priceless photo to the University of Texas in Austin. Niépce's heliograph went on display at the university's Harry Ransom Humanities Research Center, which now houses about 5 million photographic prints and negatives.

The museum staff this year turned its attention again to Niépce's heliograph. "We were sitting here with this a" agar Bongom Conton agarter Boy

marvelous, unique picture," says Ransom Center curator Roy Flukinger.

The center, which was renovating its lower two floors, planned to build a special new display for the heliograph. But since Flukinger and his staff didn't know the chemical makeup of the heliograph, they weren't sure what kinds of lighting, environments, and cases might be appropriate. No one even knew whether the current Plexiglas case, which had been filled with an inert gas in the 1960s, remained sealed or the heliograph had already been exposed to air and had undergone changes, says Ransom Center conservator Barbara Brown.

At the same time in Los Angeles, Stulik and his colleagues were considering the myriad photographs in a monumental project he'd begun in July 2001. In collaboration, the Getty, IPI, and the Research Center for the Conservation of Graphic Documents (CRCDG) in Paris aim to identify the defining characteristics of



FIRST PHOTO — This pewter plate records the earliest photographic image, taken in 1826 by Joseph Nicéphore Niépce from a third-floor window. The picture shows the lines of a roof and outbuildings.

all major photographic techniques ever used, as well as variations on those methods.

"Every photographer is an experimenter," notes Reilly. The groups plan to publish their results as a major reference volume.

It would be great, Stulik confided to his wife one day, if the project could include the fullest range of photography possible, even its earliest representation. Just two weeks later, he was surprised to receive an e-mail query from Brown. She was asking for help in preserving "View from the Window at Le Gras."

The first photograph, it seemed, was coming to him.

# On the digital edge

#### Making quick prints as good as the old-fashioned ones

s conventional chemical photography fades into history, new digital technologies have raced to the forefront of research. Ironically, one of the digital-photo industry's challenges focuses on the output that has

been the whole point of traditional photography-the print.

"There's an argument that with digital cameras, people won't even want hard copies," says Stephen J. Telfer of Polaroid in Waltham, Mass. "I don't think that's true because there are currently about 80 billion [prints from conventional film] made annually, and it's hard to imagine that all 80 billion-or a significant proportion of the 80 billion-will go away when people switch over to digital cameras."

People can already get digital prints with the look and feel of traditional prints, but "the word isn't getting out to the consumer," says Chad Munce, director of digital imaging markets for the Photomarketing Association in Jackson, Mich. Most people print digital images at home on inkjet printers, which are of varying quality.

In fact, more than 90 percent of people still print their digital-camera pictures at home, rather than at a store, says Kathy Rauschenberg of Kodak's Atlanta office.

Adds Nick Riviezzo, product manager for Fujifilm's Printpix kiosks, getting highquality digital images can be as simple as ordering conventional prints.

Many retail stores print digital images on photo paper using traditional chemical processing in a semi-automated minilab behind the counter. Some also offer kiosks where

customers make their own prints. The kiosk prints are created with a variety of techniques, including high-quality inkjet printing or methods that employ heat and dyes.

in use for more than 2 years. Found prima-

rily in Ritz camera stores, they produce images without the messy chemical processes required for making prints from regular film. Instead, Printpix uses heat to bring out dyes already built into the

print paper. Fujifilm introduced a faster version of Printpix this year. However, there is still less choice of print size at the

kiosks than in

the minilab behind the counter.

Telfer says that even faster printing of digital photos could make kiosks more attractive. With current kiosk, ink-iet, and minilab printing, the wait for the first print can take several minutes; subsequent prints follow more quickly.

Even so, that's too slow, says Telfer. The goal, he says, is "ATM-like convenience, where you can get prints right away" and almost anywhere-in airports, hotel lobbies, amusement parks, or even cruise ships.

Currently, Polaroid is introducing a new system called the Polaroid Instant Digital Printing Kiosk. It prints one photo every 2 seconds. Again, there's little choice in size. A more streamlined—and potentially

less expensive-process was described by Telfer and his coworkers at Polaroid in the Aug. 30 Science. Called acid-amplified imaging, it's more sophisticated than the technology behind other kiosks and can create prints of any size.

ALBUM OF PHOTO PROCESSES The documentation of photo

techniques is important, says Stulik, because the days of tradi-

eras at some point," says Stephen J. Telfer of Polaroid, where efforts

in photographic advances now focus on digital imaging. But with

such exciting new technologies comes the potential for destructive

of digital cameras to the introduction of Gutenberg's moveable-type

"It's so easy to lose information," says Stulik. He likens the arrival

"We expect digital cameras to replace nearly all uses of film cam-

tional photography may be numbered.

The new method prints a photo using a single sheet of paper that contains layers of different chemicals. A projector, driven by files on a computer disk or other digital medium, shines light onto the paper to generate a small amount of an acid. A heating step then converts that into a second acid that activates the dyes. This heating step currently takes about 20 seconds, but the researchers are striving to improve the process until it's as fast as the system in Polaroid's new kiosks, says Telfer.

If customers take to these high-speed kiosks, Polaroid may begin to commercialize its more advanced system, says Telfer.

But will people flock to kiosks to print photos from their digital cameras?

To answer that question for itself, Kodak in October began a 9-month study of consumers' digital-printing preferences. Participants must choose from a self-service kiosk, a station where they order prints and return in an hour, or an overnight printing service. The study monitors people's behavior at 500-digital printing locations in Atlanta, including drugstores, grocery stores, and electronics stores, says Rauschenberg.

The company already has thousands of its Picture Maker kiosks nationwide. These can enlarge, crop, and copy conventional prints as well as print digital files on paper of a set size. Kodak is also currently working with Hewlett-Packard to develop a fast inkjet system for minilabs to use when printing from digital images.

Whatever the ultimate printing process, photography is returning to its roots. Creating hard copies from digital images remains as full of chemistry as the processes by which the first photographs were taken almost 2 centuries ago. -J.G.



PAST AND FUTURE - A mobile darkroom from 1855 used during the Crimean War (top) and a new digital printing kiosk (right).

Fujifilm's Printpix machines have been

forgetfulness.

printing process in 1455. "Everything changed," says Stulik. Wouldn't it have been nice, he suggests, if someone had sat down in 1460 and described the methods used by medieval scribes to create illuminated manuscripts before people forgot how to make them?

It was with such a scenario in mind that the three art-and-research facilities joined forces to use sophisticated, nondestructive techniques to analyze thousands of photographs. When the compendium of photographic methods is finished in about 3 years, photo curators everywhere should be able to use its descriptions to identify photos in their collections, says Stulik.

Currently, most curators and conservators don't have the money, equipment, or knowledge to judge how each picture in their collection was made. They therefore don't really know how best to prevent or monitor damage from humidity, temperature, light, and other environmental factors.

Just as red and white wines need different storage conditions, Stulik says, so do various types of photographs. For now, says Reilly, "curators [often] just scratch their heads and say, 'What is that?" and then use practices that seem reasonable, if not optimal.

Brown did more than scratch her head. Last spring, she accompanied the Plexiglas case containing the world's first photograph to the Getty Center for a 2-week battery of tests.

Just as Brown had suspected, the photograph's casing was no longer sealed. Tests on gas extracted from the case revealed that it closely resembled the air outside. On a more positive note, a nondestructive analytical technique called X-ray fluorescence spectrometry definitively revealed the composition of the plate. It's pewter—an alloy of tin and lead with traces of copper, iron, and nickel. Although pewter had long been suspected, pure tin, zinc, silver, and some other materials had also been proposed, says Brown.

The researchers used infrared spectrometry to analyze the heliograph's bitumen layer, too. The goal now is to see whether the material has deteriorated over the years. The team is comparing the layer's spectroscopic signatures with those of other samples of bitumen, including specimens from near Niépce's country estate, says Brown. Some of these other samples are being artificially aged with light, she adds. These studies are continuing even though the photograph has returned to Texas.

During its sojourn in Los Angeles, "View from the Window at Le Gras" was itself well photographed for the first time. Gernsheim had tried unsuccessfully to reproduce the hard-to-see image decades earlier, even asking for help from Kodak and Scotland Yard.

The Getty work also confirmed the best way to display the heliograph: in a dark room with only a single source of light. Even so, visitors to the Ransom Center will need to walk up to the photo and move around to catch a good glimpse of it, says Flukinger. When the image does pop out at the viewer, "it is somewhat magic," he says.

More research and data analysis on the first photo are continuing, says Stulik. He and his colleagues anticipate presenting their results at a symposium in Austin next fall.

Meanwhile, the heliograph will go on display by March. Stulik and others at the Getty are designing the image's new case. Their plans take into account the newly identified chemical composition of the photograph and will include sensors for detecting oxygen concentration, humidity, and other environmental conditions. Brown will be able to watch these vital signs at the Ransom Center, while one of Stulik's colleagues can observe them in Los Angeles via the Internet.

Researchers are undertaking similar systematic study of other early photographs. There is no time for delay, they concur. "Twentieth-century photography is on the verge of becoming history," says Reilly.

Nonetheless, the first photo will always hold a special place in the world. The Niépce image is the beginning of "everything," says Flukinger. Movies, television, and video all followed in its wake. And as the world moves away from conventional chemical photography, "we're now entering a digital era that will trace back to this, too," he says. ■

# OF NOTE

## Gene may keep breast cancer at bay

Scientists have discovered a gene that seems to protect against some breast cancers. By comparing healthy breast cells with breasttumor cells, scientists at Cold Spring Harbor (N.Y.) Laboratory zeroed in on DNA differences in a gene they dubbed *DBC2* on chromosome 8.

The gene was mutated, missing, or otherwise disabled in slightly more than half the lab-grown breast cancer cell lines tested, says study coauthor Masaaki Hamaguchi, a cancer geneticist at Cold Spring Harbor. The cell lines represent roughly 90 percent of breast cancer cases, he says. A mutated version of *DBC2* also showed up in one lung cancer cell line, he and his colleagues report in the Oct. 15 *Proceedings of the National Academy of Sciences*.

Although the role of the protein encoded by *DBC2* remains unknown, tests revealed that adding a functional *DBC2* gene to breast tumor cells halted replication of those cells, suggesting it has tumor-suppressing properties, Hamaguchi says. —N.S.

#### ENVIRONMENT Rural living may hobble sperm

Many city dwellers left urban environs for quieter, cleaner lives in farm country. A new epidemiological study suggests that a man's sperm may pay a subtle price for that rural life.

Researchers previously reported evidence suggesting regional variations in the amount and quality of men's sperm. However, most of this work didn't account for smoking, recent sexual abstinence, or other factors that can greatly affect sperm. Moreover, the studies were conducted strictly in big cities.

Shanna H. Swan of the University of Missouri–Columbia School of Medicine and her colleagues worked to avoid such shortcomings in their comparison of sperm from more than 500 fertile men in Minneapolis, Los Angeles, New York City, and the much smaller Columbia, Mo.

To the researchers' surprise, the quality of sperm from Columbia men, measured by the cells' motility, was just 56 to 70 percent of that from men in the bigger cities. Columbia men also registered only 57 to 72 percent as many sperm in a milliliter of semen as did the other men. Swan's team reports its findings in an upcoming issue of *Environmental Health Perspectives*.

In a county where 57 percent of the land is farmed, Columbia is considered semirural. Because many pesticides and other agricultural chemicals disrupt the action of reproductive hormones, Swan and her colleagues are now examining whether men's sperm characteristics correlate with the concentration of such pollutants in their urine. -J.R.

#### MEETINGS

#### ADDICTION

# Mutant mice resist morphine's appeal

Morphine is a powerful painkilling drug with a well-known downside. It has "this nasty side effect of causing addiction if used inappropriately," says neuroscientist Anthony Basile, who recently moved from the National Institutes of Health (NIH) in Bethesda, Md., to the biotech company Alkermes in Cambridge, Mass.

A batch of genetically engineered mice that Basile and his colleagues created could open new ways to blocking morphine addiction. These mice lack a certain socalled muscarinic receptor, a protein on nerve cells that responds to the signal chemical acetylcholine. People and mice have five variants of this receptor. Basile's team focused on the least prevalent one.

Although seemingly normal, the mice without this receptor variant didn't become addicted to morphine after the one or two doses that it takes for typical mice to get hooked. Equally important, the drug's painkilling effect was undiminished, says Basile.

If given morphine long enough, the mutant mice did become addicted. But when deprived of the drug, the animals' withdrawal symptoms—shaking, jumping, teeth chattering—were much less severe than those of other addicted mice going cold turkey.

Basile suggests that if scientists can develop compounds that block this particular receptor variant, providing those blockers along with morphine could prevent addiction to the painkiller. Moreover, such compounds could make it easier for an addict to quit the drug, he says.

Blockers of the muscarinic receptor may help people with other addictions. The mutant mice lacking the receptor resist dependence on cocaine, too.

Unfortunately, Basile says, no one is currently investigating drugs that target the muscarinic receptor. Adds Barry Everitt of the University of Cambridge in England: "Companies have shown very little interest in developing drugs for addiction."—J.T.

#### MUSIC Scanning a brain that's out of tune

Consider a man who was such a bad piano student as a child that his teacher returned the lesson fees. By scanning this man's neural activity, researchers have Society for Neuroscience Orlando, Fla. November 2 – 7

now shown that his brain doesn't react normally to music.

A small but uncertain percentage of people have trouble recognizing melodies or playing music, a condition some researchers call dysmusia or amusia and liken to the reading disability dyslexia (*SN: 11/25/00, p. 344*).

To ascertain whether the brains of people with dysmusia differ from those of people with normal musical aptitude, Catherine L. Reed of the University of Denver and her colleagues studied a healthy 63-year-old man. Despite growing up with intensive musical training he can read music, for example—the man "cannot perceive music at all," says Reed. Tellingly, he refers to music as "structured noise," she adds.

After documenting his unmelodic bent, the researchers used a magnetic resonance imaging machine to scan the man's brain while he took various tests of language and music perception. His brain responded normally to noise, speech, and various aspects of language. When exposed to music, however, he had low-level neural activity throughout the brain, rather than higher activity focused in brain regions traditionally associated with music perception, says Reed. This suggests that the man's brain doesn't process music correctly. —J.T.

## Slow brain repair seen in Huntington's

The human brain may struggle heroically, but in vain, to replace the nerve cells that die in Huntington's disease, a New Zealand research team suggests.

Over the past few years, neuroscientists have been surprised to find that healthy, adult mammalian brains generate new nerve cells from so-called stem cells residing in select regions of the brain. It's unclear how important this ongoing neurogenesis is, but some researchers have linked it to memory storage and other brain functions.

By studying the brains of people who died with Huntington's disease, Maurice A. Curtis of the University of Auckland in New Zealand and his colleagues have shown for the first time that neurogenesis also occurs during the course of this fatal disorder. Curtis' group found evidence of a protein called proliferating cell nuclear antigen (PCNA), which marks dividing cells, and a protein called class III beta-tubulin, which is specific to new nerve cells.

Moreover, the pace of neurogenesis seemed to correlate with the severity of a person's disease at death: The brains of people worst afflicted with Huntington's showed the most PCNA.

Apparently, says Curtis, brains besieged by Huntington's can't generate new nerve cells fast enough to replace the dying ones. Or perhaps the new cells can't migrate to the damaged sites where they're needed. Ultimately, scientists aim to find ways of boosting the brain's own repair processes to counter Huntington's and related diseases, says Curtis. —J.T.

## Gene change linked to poor memory

A subtle change in a gene encoding a brain chemical may give some people better memory skills than others.

Known as brain-derived neurotrophic factor (BDNF), the chemical has become a hot topic among neuroscientists. BDNF is known to promote the development of the nervous system in early life, as well as help nerve cells survive when exposed to stresses. More recently, scientists have suggested it has a role in tuning the way nerve cells talk to each other and, thus, a role in memory.

Ahmad R. Hariri of the National Institute of Mental Health in Bethesda, Md., and his colleagues have been comparing people who have different combinations of two variants of the BDNF gene. One variant incorporates the amino acid valine at a certain spot within BDNF, while the other variant incorporates methionine there. According to Hariri, the "val" version of BDNF moves about normally inside nerve cells of the hippocampus, a brain region involved in memory. The "met" version, however, doesn't travel to BDNF's normal target locations within the hippocampal nerve cells.

People inheriting two copies of the val-BDNF variant from their parents seem to do better on certain visual-memory tasks than do people with two met-BDNF variants or one of each, says Hariri.

Furthermore, in a brain-scan study involving a visual-memory task that typically triggers nerve-cell activity in the hippocampus, the researchers found that people with two val-BDNF gene variants had more activity in that brain region than did those with one or two met-BDNF variants. —J.T.

# Books

A selection of new and notable books of scientific interest

#### **AMERICAN NORMAL: The Hidden** World of Asperger Syndrome LAWRENCE OSBORNE

Asperger syndrome is a relatively new diagnosis. In 1944, Viennese pediatrician Hans Asperger discerned that some autistic children are high functioning. People with what's now called Asperger syndrome display obsessive traits, but, unlike people with autism, they largely blend into society. They're often brilliant at math or able to perform savant-like feats of memory and calculation but are



unable to read human emotions or facial expressions. In 1994, this condition was entered into the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders. Since then, the diagnosis of Asperger syndrome has increased dramatically. Osborne interviews peo-

ple with the condition in an effort to better understand Asperger syndrome and the plight of those with it. In doing so, he considers whether people are better off being dubbed eccentric or diagnosed with a disease for which there's no cure. Moreover, he questions whether these people should be singled out at all. Copernicus, 2002, 224 p., hardcover, \$27.50.

#### FIREFLY ENCYCLOPEDIA OF INSECTS AND SPIDERS CHRISTOPHER O'TOOLE, ED.

#### FIREFLY ENCYCLOPEDIA OF REPTILES AND AMPHIBIANS

#### TIM HALLIDAY AND KRAIG ADLER, EDS.

These beautifully illustrated encyclopedias not only detail individual species, but also provide a wealth of



information about how these creatures interact with one another and people, as well as the impact they have on their surroundings. "Factfile" entries in both books feature details of species' scientific order, populations, distribution and habitat, size and color, reproduction and life cycle, and conserva-

tion status. Insects and Spiders describes all the major known taxonomic groups and paints a compelling portrait of the largely unseen lives of these creatures, including the unusual ways that insects use pheromones to communicate and other natural chemicals to

ward off predators. Reptiles and Amphibians examines the diversity of these two groups and specifically details how metamorphosis occurs in frogs, salamanders, and caecilians and how venom, especially in snakes, has evolved into such an effective tool. Firefly, 2002, 240 p., color photos/illus., hardcover, \$40.00 ea.

#### LOST DISCOVERIES: The Ancient Roots of Modern Science—from the Babylonians to the Maya DICK TERESI

The idea that the greatest scientific discoveries are rooted in Western civilization is so entrenched that contributions by other cultures are largely ignored. Teresi argues that Western sci-



ence is what it is because it was built on the best ideas other cultures had to offer. He points out that the Chinese mathematician Liu Hui calculated a value for pi in 200 A.D. The Babylonians developed what is now called the Pythagorean theorem at

least 1,500 years before Pythagoras was born. Such advances extend beyond math to medicine: The Chinese made antibiotics from soybean curd 2,500 years ago. Teresi elaborates on these achievements and many more as he gives ancient civilizations their due. S&S, 2002, 453 p., hardcover, \$27.00.

#### MR. BLOOMFIELD'S ORCHARD: The Mysterious World of Mushrooms, Molds, and Mycologists NICHOLAS P. MONEY

Fungi aren't exactly high in the affections of most people, who generally think they could just as well do without this often smelly nook of the living kingdom. Money turns that idea inside out. He reports that one fungus in Oregon covers more than 2,000 acres and



is now considered the world's largest organism. Another fungus, Madurella, can erode human bones until they look moth eaten. In an effort to enlighten readers, especially biologists, about the "intimate" connection that we

have with mushrooms and molds. he recounts the history, life cycle, and quirks of the most unusual

breeds-including Phallus impudicus, a mushroom that closely resembles a penis. Along the way, Money specifies how these organisms benefit people in inconspicuous ways and profiles mycologists, such as himself, who have devoted their careers to studying fungi. OUP, 2002, 208 p., b&w photos/illus., hardcover, \$26.00.

#### THE SCIENCE OF HARRY POTTER ROGER HIGHFIELD

illustrates how the realms of magic and science can be intertwined. Using elements of the popular Harry



Potter books as a springboard for discussions of scientific and his-THE SCIENCE OF torical issues, he reveals that the concoctions Harry had such difficulty replicating in Professor Snape's potion's class are in fact grounded in ethnobotany. He also considers whether an owl's ability to memorize locations could actually allow it to deliver mail

and whether creatures such as Fluffy-Hagrid's three-headed dog—could be created through genetic engineering. The book enlightens Harry Potter's magical realm, but also the magic taking place in labs and classrooms in our own world. Viking, 2002, 322 p., hardcover, \$23.95.

HOW TO ORDER To order these books or any other book in print, call 1-800-370-3010. Visa, MasterCard, and American Express accepted. Send checks or money orders plus \$5.95 shipping and handling (\$2.50 for each additional item) to How To Media, 28 Slocum Place, Long Branch, NJ 07740. Or see our Web site at www.sciencenewsbooks.org. This service is provided in conjunction with Science News Books

# LETTERS

#### Definitely among us

Concerning "Underground Hijinks: Thieving plants hack into biggest fungal network" (SN: 9/28/02, p. 197), these associations between fungi and parasitic plants also exist in North America. These include plants in the wintergreen family, such as Indian pipe, pinesap, and sweet pinesap. A common fungus associated with these plants is an Ascomycete that forms a subterranean structure commonly called a deer truffle. There is also a small genus of orchids, called coralroots, that obtains the majority of its nutrition from a mycorrhizal association with soil fungi. JOSEPH M. STRONG, ELYRIA, OHIO

#### Bang, clash

The research in "Big Bang Confirmed: Seeing twists and turns of primordial light" (SN: 9/28/02, p. 195) doesn't "confirm" the Big Bang theory at all. It simply confirms that scientists will jump to conclusions about observed conditions if it suits their own desire to prove a major theory. ANDY BULLOCK, FARMERSBURG, IND.

#### A cancer cause?

I was intrigued by the fact that some apoptotic cells can recover if not engulfed by another cell ("Get Rid of the Bodies", SN: 9/28/02, p. 202). DNA reassembly after the caspases tear it apart should result in many gene mutations. While most of the mutations would result in cell death, perhaps a few cells would have mutations that promote a cancerous or precancerous state. An aging or weakened immune system would allow more apoptotic cells to recover, increasing the risk of cancer.

KARL M. BIZJAK, ORINDA, CALIF.

#### Wrist shot

"Surgery beats splints for wrist syndrome" (SN: 9/28/02, p. 205) implies there are only three options for carpal tunnel syndrome: medicine, wrist splints, or surgery. I've had virtually complete relief from a fourth option suggested by a physician: exercise to widen the carpal tunnel. I know of yet another treatment for carpal tunnel syndrome: a shot of cortisone in each wrist. That worked for my mother. JACK J. FRIEDMAN,

FORT LAUDERDALE, FLA.

SEND COMMUNICATIONS TO: Editor, Science News 1719 N Street, N.W., Washington, D.C. 20036 or editors@sciencenews.org All letters subject to editing

In this far-ranging book, science journalist Highfield

# 2003 Calendars







#### Order by phone for faster service! **1-800-370-3010**

Visa, MasterCard, or American Express A service of Science News Books

See our Web site at www.sciencenewsbooks.org

#### Mind-Bending Puzzles Page-a-Day Calendar 2003 BY CLIFFORD PICKOVER

Wake your brain up each day with one of these fiendishly difficult, totally satisfying puzzles! This assortment of visual puzzles, mazes, cryptograms, mathematical hairpullers, anagrams, and other sources of perplexity and pleasures come complete with answers that appear on the flip side of each page. *Pomegrante*, 6"x 5", \$11.95

#### Easy Origami Page-a-Day Calendar 2003

Don't throw yesterday away, just fold it. Who needs a Zen garden when you can create hundreds of figures including animals, flowers, insects, birds, and miscellaneous objets d'art throughout the years. Step-by-step illustrated instructions make origami—the art of paper folding—easy and fun every day! On weekends, enjoy fun facts and folding tips. *Accord Publishing*, 6 1/2" x 6", \$12.95

#### The Easy Answer Science Page-a-Day Calendar 2003

Imagine starting every day just a little smarter and discovering something that you always wanted to know, but had never looked up. That's what this handy calendar can do for you. For instance, get answers for: How thick was the coat on a woolly mammoth? Why does iron in the blood drop suddenly when we have a fever? What are the largest animals eaten by carnivorous plants? *Accord Publishing*, 5" x 5", \$10.95

#### Latin for the Illiterati Page-a-Day Calendar 2003 BY JON R. STONE

This entertaining desk calendar raises Latin from the dead, dusts it off, and sets it speaking. It presents catchy Latin toasts and useful maledictions, exposes the Latin roots of English words and phrases, and offers proverbs and observations that are still cogent millennia after they were coined. *Pomegrante, 5* % x 4 %, *\$10.95* 

#### All Purpose Yiddish Page-a-Day Calendar 2003 BY IRA STEINGROOT

In this enjoyable translation of the *mama-loshen* (mother tongue) of the Jews of Eastern Europe, this desk calendar presents a fact-filled treasure trove of cultural and historical tidbits about Yiddish. No matter what your yichus (ancestry), you'll appreciate the information presented throughout the chadoshim (months). A pronunciation guide is included. *Promegrante, 5 %* x 4 *%* \*, *\$10.95* 

<u>How loMedia</u>	28 Slocum Pl., Long Branch, N.	07740	
Please send me the calendar(s) marked below. I include a check payable to How To Media for the price of the calendar(s) plus \$5.95 postage and handling. Add \$2.50 for postage and handling for each additional calendar.			
Min	d-Bending Puzzles, \$11.95	Origami, \$12.95	Easy Answer Science, \$10.95
Latin for the Illiterati, \$10.95All Purpose Yiddish, \$10.95			
Name		Daytime F	Phone
Addus as			(used only for problems with order)
Address			
City		State	Zip







