

SCIENCE NEWS

THE WEEKLY NEWSMAGAZINE OF SCIENCE

SEPTEMBER 24, 2005 PAGES 193-208 VOL. 168, NO. 13

thai view of sex trade
schizophrenia drugs scrutinized
bees cook invaders
martian activity

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non-scents

RESURRECTING LOST FRAGRANCE

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SEPTEMBER 24, 2005 VOL. 168, NO. 13

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SCIENCE NEWS is printed in the United States on process chlorinefree paper containing 90% recycled fiber with 20% postconsumer waste.



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

POSTMASTER

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 © 2005 by Science Service. Title registered as trademark U.S. and Canadian Patent Offices. Printed in U.S.A. on recycled paper. ♻️
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SCIENCE NEWS

This Week

Meds Alert

Old schizophrenia drug stands up to new ones

A class of recently developed medications for schizophrenia has rapidly become psychiatrists' treatment of choice. Small, pharmaceutical company-funded trials had suggested that the drugs are safer and more effective than a generation of antipsychotic substances that has been used since the 1950s.

A new federally funded study of unprecedented size and length calls into question that conclusion. One of the older medications alleviates schizophrenia symptoms about as well as three of the newer, so-called atypical antipsychotics do, say psychiatrist Jeffrey A. Lieberman of Columbia University and his colleagues.

A fourth atypical antipsychotic, olanzapine, yielded slightly more reduction in symptoms than the other drugs did. However, 9 percent of those receiving olanzapine experienced substantial weight gain and metabolic disturbances that can cause diabetes and shorten life, more than twice the proportion for any other drug in the study.

Two-thirds of patients taking olanzapine stopped using it before the 18-month study ended, but three-quarters of participants randomly assigned to any of the other four drugs halted treatment before the study ended. Patients typically stopped using a drug because of lack of improvement or unacceptable side effects.

Schizophrenia patients typically try several antipsychotics before settling on one. "There's no question that atypical antipsychotics work, but they don't fulfill all expectations," says Lieberman.

Atypical antipsychotics cost up to 10 times as much as the older drugs do. Schizophrenia, which affects roughly 1 in 100 people around the world, is a chronic illness that includes hallucinations, delusions, confused thinking, and severe apathy. Antipsychotic medications primarily quell hallucinations and delusions.

Lieberman's team studied 1,493 patients,

18 to 65 years old, who have schizophrenia. These volunteers were already receiving an antipsychotic medication and various types of psychosocial treatment at any of 57 clinical sites in the United States.

Initial results from the project, which ran from 2001 through 2004, appear in the Sept. 22 *New England Journal of Medicine*.

Participants began treatment with a new drug, randomly chosen from five medications. The four atypical antipsychotics were olanzapine, quetiapine, risperidone, and ziprasidone; the older drug was perphenazine.

The researchers were surprised to find that muscle rigidity, tremors, and other movement disorders that psychiatrists had primarily associated with older drugs occurred at the same low rate with all five medications tested. The most-common side effects for the drugs included sleep problems, constipation, and decreased sex drive.

Lieberman's data dovetail with earlier U.S. evidence (*SN*: 2/9/02, p. 83) and with a recent clinical study in England, described at a schizophrenia conference in April. In the latter test, 250 patients with schizophrenia exhibited comparable improvement over 1 year, regardless of whether they had been randomly assigned to receive an atypical antipsychotic or an older drug.

"These results remind us that some people do very well on cheap and cheerful first-generation drugs," says psychiatrist Peter B. Jones of the University of Cambridge in England, who directed the British study.

The new studies "support the view that we have a big problem with all [antipsychotic] drugs," remarks psychiatrist William T. Carpenter Jr. of the University of Maryland School of Medicine in Baltimore. Drug companies still need to develop antipsychotic drugs that ease thinking disturbances and apathy, which

play crucial disabling roles in schizophrenia, he says.

Olanzapine-induced weight gain and metabolic changes may be especially dangerous, Carpenter notes, because patients with schizophrenia typically smoke, rarely exercise, and eat poorly. "That scares the hell out of me," he says. —B. BOWER

Steep Degrade Ahead

Road salt threatens waters in Northeast

Chlorides from road salt used in the winter to clear icy highways in the northeastern United States are increasingly tainting streams throughout the region, according to long-term studies of water quality.

Measurements in rural New Hampshire, New York's Hudson River Valley, and Baltimore County, Md., show that the concentration of chlorides in streams has risen dramatically. In the past 25 years, chloride concentrations have tripled to reach 30 milligrams per liter at some sites near Baltimore, says Peter M. Groffman of the Institute of Ecosystem Studies in Millbrook, N.Y. Over the same period, concentrations have nearly quadrupled to 70 mg/l in streams near an interstate highway in New Hampshire.

Groffman and his colleagues found that a stream's average chloride concentration is closely correlated with the percentage of the surrounding area that's covered by roads and other impervious surfaces. So, much of that chloride probably comes from road salt, which contains predominantly sodium chloride, the researchers say



SALTY RECIPE The winter use of road salt in the northeastern United States is boosting the concentration of dissolved chloride in many of the region's streams.

T. O'BRIEN/DELAWARE DEPARTMENT OF TRANSPORTATION

in the Sept. 20 *Proceedings of the National Academy of Sciences*.

Even streams in rural areas with just a few roads have chloride concentrations significantly higher than those in roadfree regions. Near Baltimore, streams unaffected by road salt typically showed 2 to 8 mg/l chloride.

At the present rate of increase, the chloride concentration in streams at many sites in the Northeast will exceed 250 mg/l by century's end, Groffman and his colleagues project. At that chloride concentration, they caution, water is nonpotable and toxic to some aquatic life. —S. PERKINS

Fresh Mars

Craft views new gullies, craters, and landslides

Mars may have been cold and dry for billions of years, but it's still an active place. A comparison of images taken just a few years apart by a Mars-orbiting spacecraft reveals freshly carved gullies and recent landslides. It also shows that a recently found, 20-meter-wide crater is only about 25 years old.

The images, taken by a camera aboard the Mars Global Surveyor spacecraft, provide evidence supporting earlier observations that the Red Planet's south polar cap is shrinking at a rate of about 3 meters every 2 Earth years. That's an indication that the planet, though frigid, is significantly warmer than it was just a few centuries ago, when frozen carbon dioxide was deposited to create its pitted terrain.

Michael C. Malin of Malin Space Science Systems in San Diego announced the findings this week during a telephone briefing. Malin's team built the camera on Surveyor, which began orbiting Mars in 1997.

The most intriguing of the new features could turn out to be the gullies, which are located in sand dunes, comments planetary scientist Jack Mustard of Brown University in Providence, R.I.

Malin and his collaborators had previously found gullies on the slopes of craters near both poles. The team attributes those gullies to the seepage of groundwater (SN: 7/1/00, p. 5). Malin argues that the new gullies arose within the past few years when frozen carbon dioxide trapped in the sand vaporized during a Martian spring. A sud-

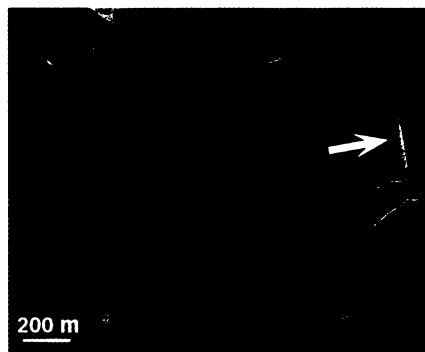
den release of the gas could have caused sand to flow like a liquid.

But Mustard notes that these gullies might instead have been carved by deposits of frozen water that briefly liquefied in the sand. If so, the dunes could supply "jugs of water" for astronauts that may someday land on the Red Planet, he says.

The gully debate may soon be settled. A spectrometer aboard the Mars Reconnaissance Orbiter, scheduled to arrive at the planet next March, is expected to discern whether the gullies contain frozen water or carbon dioxide.

A separate set of Surveyor images reveal that between November 2003 and December 2004, more than a dozen boulders slid from the wall of a crater to its bottom, leaving behind tracks on the dusty slope. Either strong winds or a quake could have caused this landslide, as well as others documented by Surveyor, Malin says.

Yet another cache of images from the craft is revealing surprising information on how infrequently the planet has been bombarded by meteorites over the past century, Malin says. Surveyor spotted a crater that wasn't there when the Viking orbiter imaged the same region in 1976. Examining Surveyor images of the crater recorded in 1999 and 2005, Malin's team measured the amount by which dark streaks of material ejected by the impact had faded. The rate of fading indicates that the crater formed in the early 1980s. In a similar analysis, the team identified several other craters that appear to have formed within the past 100 years.



GOLLY! Image of a Mars sand dune shows no gully in 2002 (left), but gullies (arrow at right) and channels formed in the dune by 2005.

This record, although limited to the 4 percent of the planet that Surveyor's camera has examined at high resolution, suggests that during the past century, the planet has been smacked by large chunks of space debris at only one-fifth the rate that theorists had estimated, Malin says.

However, Surveyor might not be privy to the whole picture, notes Mustard. Most of the craters seen by the craft come from bright areas where dark streaks of crater

material are easiest to spot. Many craters may remain hidden because they lie on a dark background, Mustard says.

Surveyor is funded to continue its exploration of Mars through 2006. —R. COWEN

Dim View

Darkening skies
a regional phenomenon

The decline in the solar radiation reaching Earth's surface in the latter half of the 20th century—a trend observed at many locations worldwide for several decades—turns out to have been primarily a regional phenomenon, new research suggests.

On average, about 342 watts of solar radiation strike each square meter at the top of Earth's atmosphere. As much as one-third of that radiation immediately bounces back into space. A small amount gets absorbed within the atmosphere. The rest—about two-thirds of the total—arrives at the planet's surface.

Radiation reaching the ground at many locations declined significantly from the 1950s to the 1980s, a trend that some scientists have dubbed global dimming. At some sites, the solar radiation dropped as much as 2.7 percent per decade, says Yoram J. Kaufman, an atmospheric scientist at NASA's Goddard Space Flight Center in Greenbelt, Md.

Now, analyses by Kaufman and his colleagues indicate that dimming was much stronger in some regions than in others. The researchers found that solar radiation reaching ground level at 318 sites worldwide declined, on average, about 0.27 watt per square meter (W/m^2) each year between 1964 and 1989. However, the 144 of these sites that are located near cities with more than 100,000 residents experienced an even stronger average dimming—about 0.41 W/m^2 annually, says Kaufman.

The largest dimming was chronicled in and near densely populated sites between latitudes of 10°N and 40°N , where most of the world's industrial activity occurs. At those sites, solar radiation dropped about 1.25 W/m^2 each year. These findings, which dispel the notion that dimming is uniform globally, also hint that the phenomenon has a human cause, says Kaufman. The researchers present their findings in the Sept. 16 *Geophysical Research Letters*.

Because most of the world is sparsely populated, dimming is essentially a regional effect, Kaufman's team argues. However, even the 0.16 W/m^2 average annual decline seen at sparsely populated sites adds up over a quarter century to a decrease of 4 W/m^2 , notes Beate G. Liepert, a climatologist at Lamont-Doherty Earth Observatory in Palisades, N.Y.

MALIN SPACE SCIENCE SYSTEMS, JPL/NASA

"That's still a lot," she says.

Kaufman and his colleagues showed that at some tropical sites, the skies got brighter, not dimmer. At the 21 sparsely populated sites between 15°N and 15°S, solar radiation reaching the ground rose by 0.58 W/m² per year. That may be a result of decreasing cloudiness in those locales, Kaufman notes.

On average, about 60 percent of the dimming effect comes from increased cloud coverage, Liepert adds.

Understanding the size and distribution of the dimming effect observed in the past, as well as determining how much of it resulted from pollutants and how much from clouds, will enable scientists to refine climate models, says Rachel T. Pinker of the University of Maryland in College Park.

Dimming trends since the early 1990s have been mixed. When communism—and the economies—collapsed in many eastern European countries in the early 1990s, industrial emissions declined and the skies became clearer. More recently, however, skyrocketing industrialization in China, India, and many areas of southern Asia has spawned the Asian brown cloud, a plume of pollution that causes acid rain (*SN*: 6/16/01, p. 381) and blocks sunlight more effectively than some natural clouds do (*SN*: 1/6/01, p. 15). —S. PERKINS

Balls of Fire

Bees carefully cook invaders to death

Honeybees that defend their colonies by killing wasps with body heat come within 5°C of cooking themselves in the process, according to a study in China.

At least two species of honeybees there, the native *Apis cerana* and the introduced European honeybee, *Apis mellifera*, engulf a wasp in a living ball of defenders and heat the predator to death. A new study of heat balling has described a margin of safety for the defending bees, says Tan Ken of Yunnan Agricultural University in Kunming, China.

He and his team also report in an upcoming issue of *Naturwissenschaften* that the native bees have heat-balling tricks that the European bees don't. That makes sense, the researchers say, since the Asian bees have long shared their range with the attacker wasp *Vespa velutina*, but the European bees became widespread in Asia only some 50 years ago and so have had much less time to adapt to the wasp.

The attacker wasps are "gigantic," says Thomas Seeley of Cornell University, who studies bee behavior. Of all social insects, the species has the largest workers, with wingspans that can stretch 5 centimeters. The wasps build large versions of the papery



KILL ZONE Honeybees mob an invader wasp, revving up their body heat until the attacker dies.

nests of hornets found in North America, and they specialize in breaking into other social-insect nests and carrying off larvae as food for young wasps.

"I've seen a single wasp overwhelm a colony of 6,000 bees" of a species that doesn't make heat balls, says Seeley. The invader wasp stands at the nest's entrance as one guard bee after another comes out to defend its home. "The wasp cuts the guard into pieces ... and waits for the next one," says Seeley. When all the defenders are dead, "the wasps strip-mine out the larvae," he reports.

However, a few honeybee species can defend themselves by surrounding an invader. Researchers used to think that the few-dozen bees were trying to sting the wasp, says Seeley. Thermal cameras, however, revealed the balls' soaring heat.

To see what margin of safety the bees have, Tan and his research colleagues presented tethered wasps to six colonies each of native Asian bees and European bees. At each nest, worker bees engulfed the wasp immediately. Within 5 minutes, the center of a typical bee ball had reached 45°C.

To check the bees' and wasps' tolerance for heat, researchers then caged each of the species in incubators and systematically cranked up the temperature. The wasps died at 45.7°C, but the Asian honeybees survived heat to 50.7°C and the European bees made it to 51.8°C.

The native Asian bees, ancient adversaries of the wasps, mobilized half again as many defenders into a heat ball as the European bees did, the researchers report. Furthermore, Asian bees not mobbing the wasp were more likely to take shelter during an attack than bystander European bees were.

Heat balling is the flip side of bees nursing larvae in a nest, says Seeley. To keep the youngsters at the right temperature in cool weather, honeybees space themselves around the nursery and shiver their pow-

erful flight muscles to generate heat. Seeley notes, however, that the nursemaids don't raise the temperature above 36°C, so the brood stays safe. —S. MILIUS

Organic Choice

Pesticides vanish from body after change in diet

Children can eliminate their bodies' loads of agricultural pesticides by eating organically grown products, a 15-day experiment suggests. The finding bolsters the case that people dining on organic food avoid potentially toxic pesticides, but it doesn't directly address whether such foods provide health benefits.

"Organic food is a viable intervention to control pesticide exposure," environmental health specialist Doug Brugge of Tufts University School of Medicine in Boston says of the new study. "What you would like, in addition, is evidence that those reductions are associated with health improvements."

Pesticides known as organophosphates can cause problems in childhood neurological development. In the past decade, the U.S. government has restricted the use of many of these chemicals. However, the organophosphates malathion and chlorpyrifos are still legally used on many conventional crops.

Chensheng (Alex) Lu of Emory University in Atlanta and his collaborators recruited 23 families in suburban Seattle. Before the study, each child, age 3 to 11 years, ate only conventionally grown produce and had no other known exposures to organophosphates. Some of the same researchers had earlier found evidence that switching a child to an organic diet reduces organophosphate concentrations in the body (*SN*: 2/22/03, p. 120).

TAN

Lu's team bought organic-food items and gave them to the children's parents. On days 4 through 8 of the study, the families were asked to substitute the organic foods—including fruits and vegetables, fruit juices, cereals, and pastas—for conventionally grown products. The researchers asked parents to use the substitute products to prepare the same meals that each child would normally eat. After day 8, the families resumed using conventional products.

The parents collected two daily urine samples from each child, and the researchers tested the samples for by-products of malathion, chlorpyrifos, and several less-common organophosphates.

Malathion and chlorpyrifos by-products were present in all the children's urine before and after the 5 days of organic eating. During the organic-food period, however, those by-products were undetectable in most of the urine samples, the researchers report in an upcoming *Environmental Health Perspectives*.

Organic diets might not substantially reduce organophosphate exposure in all children. Some urban homes contain residues of the pesticides left from efforts to battle insect infestations, Brugge says.

Nevertheless, he adds, "in a population that does not have other pesticide exposures, eating organic foods virtually eliminates organophosphate-pesticide burden in the children." —B. HARDER

Pack Rat Piles

Rodent rubbish provides ice age thermometer

For a person, life as a pack rat is one of obsessively collecting, say, newspapers, computer parts, food containers, or maybe all of these. But a literal pack rat gathers plant fragments, bone bits, fecal pellets, and even, occasionally, eyewear.

"A friend of mine lost his glasses to a pack rat," says Kenneth Cole of the U.S. Geological Survey in Flagstaff, Ariz. In the September *Geology*, Cole and a colleague report that pack rats' fossilized collections, secreted away for millennia in caves and rocky overhangs, can improve the portrait of global temperatures at the end of the last ice age.

Known as the Younger Dryas, this portion of the ice age lasted from about 12,900 to 11,600 years ago. Temperatures in Europe, Greenland, and the North Atlantic

Ocean during this time averaged 10°C below today's average temperatures. Scientists have relied on many lines of evidence to reconstruct climate trends. Layers of ice and sea sediment, for example, indicate precipitation and atmospheric composition.

These techniques can't be used everywhere, however. So, in the arid deserts that surround the Grand Canyon, Cole and Samantha Arundel of Northern Arizona University in Flagstaff have turned to pack rats' fossilized collections, or middens.

In their study, the researchers found that Younger Dryas winters in the region around the Grand Canyon averaged as much as 8.7°C cooler than winters there do today. That's about 4°C below previous estimates.

Cole and Arundel revealed the local ice age climate by considering the unique temperature gradient of the Grand Canyon along with clues from pack rat scat and fossilized pieces of a plant called Utah agave that turn up in middens.

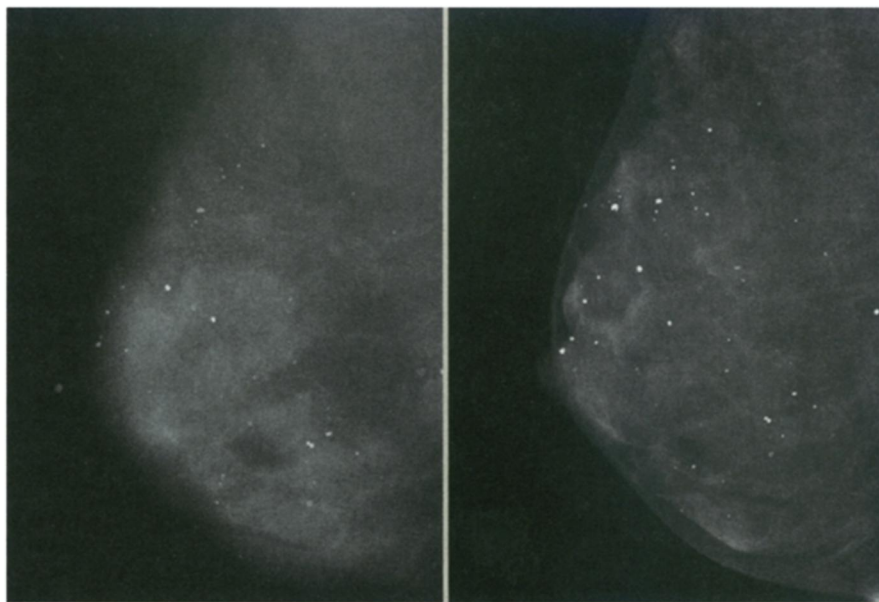
"If you walk down the canyon," Cole explains, "it's like walking from Oregon to Las Vegas." That temperature trend was also present during the last ice age. Cole and Arundel reasoned that if they could determine an ancient temperature within the canyon, they could extrapolate to the temperature at the rim and in the surrounding area.

That's where the Utah agave comes in. It can't grow where temperatures fall below -8°C. Assuming that the pack rats have a limited range, when the researchers found agave in a midden within the Grand Canyon, they proposed that the location had been above this temperature.

To determine whether an agave-containing midden had originated during the Younger Dryas years, the researchers applied radiocarbon dating to fecal pellets in the same midden. From the location of Younger Dryas middens containing agave and the known temperature gradient, the scientists could infer the ice age temperatures around the canyon.

"This is remarkable detail that more or less matches, in timing and magnitude," the temperature changes found from studying layers of ice in Greenland, comments Julio Betancourt of the U.S. Geological Survey in Tucson. Betancourt notes, however, that the data from pack rat middens are "messy and subject to large uncertainties" because radiocarbon techniques can pinpoint a date only to within roughly 100 years.

Nevertheless, Cole predicts that the new temperatures will be used in computer simulations to give researchers a better global picture of past temperatures and perhaps to project temperatures into the future. —K. GREENE



Sharpening the focus of mammograms

A mammogram of healthy breast tissue recorded on film (left) isn't as clear as a digital mammogram (right). Scientists X-rayed 42,760 women's breasts with both digital and film machines. Overall, the techniques detected cancer equally well. But in women with dense breast tissue and those under 50, digital readouts detected up to 28 percent more cancers than film did. Digital mammography captures an image on an electronic X-ray detector, which sends the information into a computer, where it can be enhanced. Radiologist Etta D. Pisano of the University of North Carolina at Chapel Hill led the study, which will appear in the Oct. 27 *New England Journal of Medicine*. The white spots in the pictures above—not from the new study—are calcium deposits, which can be signs of cancer when they cluster. —N. SEPPA

GE HEALTHCARE

CHILDHOOD'S END

In Thailand, poverty isn't the primary reason
that girls become prostitutes

BY BRUCE BOWER

For people concerned with child welfare and human rights, the rural villages of northern Thailand loom as a heart of darkness. National policies on land ownership have led to the demise of many family farms in this agricultural area during the past 30 years, so northern Thais have increasingly trekked far from home in search of jobs. A well-publicized and shocking aspect of this phenomenon has been the massive trafficking of Thai women and girls from the north in the sex industry of Bangkok and of cities in richer Asian nations.

It's unclear precisely how many child prostitutes Thailand has produced. The U.N.'s International Labor Organization estimates that 100,000 to 200,000 Thai women and girls work in a variety of overseas venues where sex is sold. The Protection Project, a human rights research institute in Washington, D.C., places the number of Thai females participating in Japan's commercial sex market alone at between 50,000 and 70,000.

U.N. and human rights groups alike have assumed that prostitution and other forms of child exploitation stem from a toxic social brew of poverty mixed with a lack of education and job training. Anti-prostitution programs in northern Thailand—a farming region without a major city—now focus on promoting better schooling for girls and teaching vocational skills to villagers.

Enter Lisa Rende Taylor. An anthropologist at the Asia Foundation, a nonprofit policy-and-research organization headquartered in San Francisco, Rende Taylor directed a 14-month study of child labor, prostitution, and sex trafficking in two northern Thai villages. Her results, published in the June *Current Anthropology*, challenge conventional wisdom about why so many of the region's girls end up selling their bodies in brothels, massage parlors, teahouses, and snack bars across Asia.

"Neither poverty nor lack of education are the driving forces behind trafficking of northern Thai children," Rende Taylor says. Daughters from both poor and relatively well-off families become prostitutes in roughly equal proportions, she finds. Moreover, some girls who complete primary or even secondary levels of education also enter the sex trade.

Many northern Thai girls regard prostitution as a "bearable choice," according to Rende Taylor, because they feel obligated to repay their parents for past sacrifices and to improve the family's financial standing. That obligation stands even if the parents own farmland and make a decent living. In a setting devoid of any other well-paying job opportunities, the oldest profession represents the only way for a girl to make enough money to maintain or enhance her family's property and status in the village. In landowning families, middle-born daughters are the most likely to become prostitutes.

First-born girls typically stay at home to assist their parents in daily tasks and thus rarely enter the sex trade. Middle-born girls are traditionally regarded as the family's financial helpers. Thanks to the labor of their older sisters, last-born girls typically receive more schooling than their sisters. Still, it's not uncommon for them, too, to spend time as prostitutes after completing the equivalent of elementary or high school. They work to recoup education costs and strengthen family finances, Rende Taylor says.

"It's common for one female sibling to be working in the fields alongside the parents, another to be working in a bar in Bangkok, and perhaps another getting a secondary education," remarks Rende Taylor.

In contrast, parents don't expect much payback from sons, who move into the homes of their wives' families after marriage.

Female prostitution in northern Thailand is often a family choice, Rende Taylor says. Therefore, interventions to stop sex trafficking must address such factors as a girl's need to earn money for family status. Such an approach would differ from methods used elsewhere around the world, where human rights workers have good reason to suspect that many youngsters sell

"It is important to get away from unhelpful stereotypes of passive trafficked victims."

—LISA RENDE TAYLOR,
ASIA FOUNDATION

sex because they've been coerced, abandoned, kidnapped, or sold into virtual slavery to pay off parental debts.

FAMILY TIES It's daunting to ask women in a foreign country to talk about how many of their daughters work as prostitutes and why they permit them to do so. And it's especially difficult to get honest answers.

In her fieldwork, Rende Taylor had two advantages in gaining the trust of residents in a pair of northern Thai farming villages, each consisting of

about 150 families. First, being half-Thai herself and having relatives in a neighboring province of Thailand, she spoke the native language and looked much like the women whom she was studying. Second, her research team consisted of six women from nearby villages who were aware of how area girls were recruited to work in sex emporiums throughout Asia.

Moreover, village headmen had approved of the study and were consulted during the project.

During parts of 1999, 2001, and 2002, Rende Taylor's team interviewed all currently or formerly married women in the two villages, a total of 299 individuals. Their ages ranged from 18 to 109. With assistance from some of the women's adult children, the researchers chronicled the personal histories of the women and their 677 children. The team noted amounts of education, jobs held, number of marriages, and long-distance moves.

Of 244 daughters performing full-time labor of some kind, 62 had been involved in commercial sex work. Many had recruited village girls for sex traffickers or served as prostitutes in Bangkok,

Malaysia, Singapore, or Japan. The other daughters worked primarily in sweatshops or as scavengers.

Daughters of landowning and landless parents entered the sex trade with comparable frequency and almost always with their parents' knowledge. Land is the major currency of wealth in northern Thailand, as most farming families don't save any cash.

Middle-born daughters from landowning families were about twice as likely to do stints as prostitutes as their sisters were. Birth order made little difference in landless families, where prostitution surged among girls whose mothers had remarried.

Stepfathers and step siblings may have put extra pressure on girls to earn family money in the high-wage sex industry, Rende Taylor suggests.

In all families, daughters involved in prostitution remitted large amounts of money to their parents. Several families used the income to build huge, fancy houses next to the older, wooden-stilt houses of neighbors.

In an economy that offers girls no viable alternatives for earning enough money to meet family obligations, prostitution is viewed as an acceptable, if still socially frowned-upon, choice, Rende Taylor asserts.

At the same time, Buddhist beliefs in northern Thailand contribute to community acceptance of former prostitutes, who often marry local men, says Rende Taylor. Thai Buddhists hold that each person's soul inhabits many physical bodies over time, with the quality of each life influenced by the soul's store of merit. Prostitution performed out of the need to aid one's family builds up merit, despite the nature of the job itself.

Most former prostitutes that Rende Taylor's team spoke to said that they had worked short hours and had had the freedom to choose or reject clients. The women generally didn't regret what they had done.

"The trauma inflicted on a Thai woman's psyche by commercial sex work may be different from and, barring coercion or violence, less than that sustained by a Western woman," Rende Taylor suggests.

CHILD SUPPORT In 1993 and 1994, anthropologist Heather Montgomery of the Open University in Milton Keynes, England, interviewed 50 Thai girls who worked as prostitutes in a slum adjacent to a tourist resort. These girls' reported feelings of indebtedness to their parents and desire to repay them financially were echoed in Rende Taylor's more-recent findings, Montgomery says.

A 12-year-old girl, who had earned enough money from one sex client to rebuild her parents' house, excitedly told Montgomery, "I will make merit for looking after my parents." The young Buddhist believed that such merit would bless her in her next life and negate the effects of having been a prostitute.

Montgomery wrote about her experiences with such children in a 2001 book *Modern Babylon? Prostituting Children in Thailand* (Berghahn Books, Oxford).

Observations such as Montgomery's, as well as Rende Taylor's report, illuminate the reasoning of some child prostitutes. "If policy makers are serious about ending the problem ... it is important to get away from unhelpful stereotypes of passive trafficked victims," Rende Taylor says.

In her opinion, intervention projects should open to local Thai

girls key positions that are held in high esteem by villagers and typically filled by outsiders with more education than the locals have. These jobs include bookkeeping, government administration, and research for international companies targeting goods to the Thai market. Young women holding these jobs could stay in their home villages while bringing status and income to their families.

The new data raise the prospect that Thai families hedge their bets by sending only some of their daughters into prostitution. Psychologist Christine Liddell of the University of Ulster in Londonderry, Northern Ireland, says that the parents studied by Rende

Taylor often selected middle-born girls for prostitution to limit any damage to household functioning should the risky venture fail to yield much revenue or result in harm to a child. For farming families facing uncertain prospects, first-born "home helpers" and well-schooled last borns may be less expendable than middle borns are, Liddell says.

She argues that increasing demands for children in the global sex trade and the continuing decline in numbers of family farms in Thailand promote child prostitution far more than any calculated decisions by northern Thai parents do.

Given the limited size of Rende Taylor's study, it's not clear that parents have much say in whether their daughters become prostitutes, remarks anthropologist Bernard Formoso of the University of Paris. Parents probably permitted girls and boys alike to seek their destinies—an important concept in Buddhism—by temporarily migrating to cities such as Bangkok, where some girls entered the sex trade, he says.

Rende Taylor disagrees. Parents are indeed urging their children into prostitution, she reports. Her findings reflect a "dangerous tradeoff" that northern Thai families make. In

her view, parents permit certain daughters to face prostitution's hazards in order for the family to reap its unparalleled financial returns.

DISEASE DANGERS A frightening specter looms over the entire business of selling sex—the possibility of contracting and spreading AIDS and other sexually transmissible diseases.

Rende Taylor has yet to explore whether or how concerns about AIDS influence the decisions of northern Thai families to permit their daughters to become prostitutes. The disease has certainly made its presence known in the two villages where she worked. In 2002, 13 percent of families in one village and 3 percent of those in the other reported one or more members infected with HIV or diagnosed with AIDS.

A decade ago, Thai prostitutes who spoke to Montgomery repeatedly told her that they would get pregnant or contract diseases only if it was their fate. Thus, they almost never used contraceptives or received medical checkups.

In northern Thailand, increasing rates of HIV infection among former prostitutes may soon cause at least some parents to keep their daughters out of the sex trade, predicts anthropologist Monique Borgerhoff Mulder of the University of California, Davis.

Rende Taylor regards only one thing as certain: The phenomenon of child prostitution can look dramatically different through the eyes of those whom it directly affects. ■



SAVE THE FLOWERS

Would-be scent engineers aim to resurrect lost floral fragrance

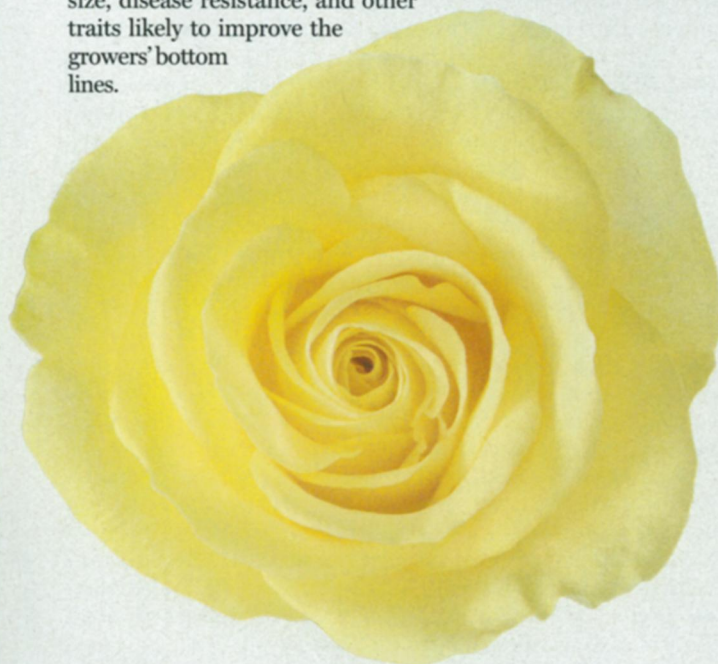
BY IVAN AMATO

Vince Agnes, as well-appointed as the flowers that he has been selling for more than 60 years in his shop in Silver Spring, Md., remembers when all his roses smelled as good as they looked. When he opened for business in the 1940s, there were only a few varieties: red, white, yellow, and pink, he recalls. "Now, there are thousands," Agnes says, "but only a few have a lot of scent."

No one knows what's responsible for this waning of fragrance by roses and other ornamental-flower varieties, including carnations and chrysanthemums, but scientists who investigate floral scent suspect that the flower breeding that's led to an estimated 18,000 rose cultivars in an ever-widening spectrum has run roughshod over fragrance.

"Pigment compounds are derived from the same biochemical precursors [as scent compounds are], so it makes sense that if you make more of one you get less of the other," notes floral-scent biochemist and geneticist Eran Pichersky of the University of Michigan in Ann Arbor.

Floral scent may be dwindling because breeders for the \$30 billion ornamental-flower industry pay scant attention to this most emblematic attribute of flowers. "In order of [commercial] priority, color is number 1 through 10," says Alan Blowers, head of flower biotechnology for Ball Helix, a biotech company in West Chicago, Ill., devoted to the ornamental-plant industry. Beyond color, breeders have been targeting improvements in flower longevity, shape, size, disease resistance, and other traits likely to improve the growers' bottom lines.



Fragrance is different. It's invisible, and its sensory impression is as subjective as taste. And, as it turns out, fragrance is a genetically complex trait that's difficult to manipulate by ordinary breeding methods. Despite those obstacles, Blowers predicts, "fragrance will become important again," as the molecular biology underlying floral scent becomes better understood.



With a nose both for understanding the molecular origins of floral scents and for engineering what could be blockbuster flower varieties, researchers have been teasing out the complex biochemical orchestration underlying one of life's simplest pleasures. They've been uncovering fragrance-related genes, the enzymes encoded by those genes, the in-cell reactions that these enzymes catalyze, and the fragrant performance of all this molecular biology—a vast aromatic harmony of alcohols, aldehydes, fatty acids, terpenoids, benzenoids, and other volatile, and therefore sniffable, chemicals.

In the past few years, flower scientists have assembled enough knowledge and technology to consider resurrecting scents in flowers that have lost them or engineering plants that produce scents never before experienced by a bee, beetle, or gardener.

The researchers "have pushed the envelope in terms of our eventual ability to change floral scent," says Michael Dobres, head of the Philadelphia biotech company NovaFlora, which is developing genetic methods for controlling various traits of ornamental flowers.

DECONSTRUCTING SCENT The plant world perfumes, or sometimes stinks up, the environment with a vast roster of volatile organic chemicals. Scientists have so far identified about 1,000 of these compounds emanating from petals, leaves, and other tissues.

"There could be up to 50, maybe 100, chemicals involved in a particular scent," says Pichersky.

Usually, only a few of the volatile chemicals in a fragrance are obviously noticeable to human noses. One whiff of 2-phenylethanol, for instance, and images of roses come to mind, even though scores of volatile chemicals contribute to the fully detailed scent of roses. Like harmonics that help the ear distinguish a middle C played on a piano from one played on a violin, the minor chemical components of a scent provide the olfactory subtleties that individualize the scent of a particular rose variety.

Pichersky, who grew up on a kibbutz growing flowers and other crops in his native Israel and now lives on a 30-acre farm outside Ann Arbor, has been gardening all his life. He has made it his mission to uncover as much as he can about the biosynthesis of floral

BRAND X PICTURES; J.A. MILLER



scent
and the bio-
logical roles that

these scents play. In 1996, he and his colleagues in Michigan were the first to discover a gene that produces a floral scent.

Not only do the volatiles in botanical scents attract pollinators and delight the human nose, he notes, but they also serve to protect plants from pathogens and pests. For example, when some plants come under attack by munching caterpillars, they emit specific chemicals as clarion calls for parasitic wasps. The wasps alight on the marauding caterpillars and lay eggs, which hatch into larvae that eat the caterpillars alive. "It's a chemical arms race out there," says Pichersky.

As the first step in analyzing the complex biochemical choreography behind a floral scent, Pichersky and his coworkers in 1994 worked out the amino acid sequence of the enzyme linalool synthase from petals of *Clarkia breweri*, a purple wildflower native to California. They then used that information to identify the enzyme's gene.

Through painstaking biochemical analysis, the researchers discovered that this enzyme converts the substrate geranyl pyrophosphate into linalool, a volatile compound with what Pichersky describes as a "wine-sweet" smell. Geranyl pyrophosphate was already known as an intermediate in the metabolic pathway that produces cholesterol compounds.

Since then, Pichersky's group and others have uncovered about 25 more floral-scent genes. Natalia Dudareva, a former postdoc student of Pichersky who now runs her own floral-scent laboratory at Purdue University in West Lafayette, Ind., estimates that the present list of known scent genes and their associated enzymes can account for the cellular synthesis of no more than 5 percent of the plant volatiles that scientists have identified.

The enzymes encoded by floral-scent genes fall into a few functional categories with names such as synthases, methyl transferases, and carboxymethyltransferases. Enzymes in a given category impose a particular kind of biochemical transformation on cellular chemicals that arise from the basic, or primary, metabolism that all plants share.

The outcome of the transformation differs according to the specific plant. For example, in snapdragons, one particular methyltransferase enzyme adds a methyl group (a central carbon hub bonded to three hydrogen atoms) to benzoic acid, producing methyl

benzoate. In *C. breweri*, the same enzyme instead methylates salicylic acid, producing methyl salicylate. Scientists call such species-specific biochemical products secondary metabolites.

Mixing and matching enzymes and substrates in varying sequences of reactions creates a bazaar of secondary metabolites, Pichersky notes. That's how a lilac or honeysuckle, for example, can produce its own intoxicating cocktail of fragrance compounds.

Discovery in floral-fragrance biochemistry is on a fast track, now that lab devices can identify and analyze the activity and interactions of hundreds to thousands of genes and proteins at once. For example, Pichersky and a large collaboration of researchers working primarily in Israel, a flower-exporting country, compared the genetic activity of Fragrant Cloud, a scented rose cultivar, with that of Golden Gate, an unscented one. From an initial roster of more than 2,000 genes that the researchers identified as active in these two cultivars, the team pinpointed a few genes that appeared to be involved in scent production. This led the search to previously unrecognized enzymes, which the researchers demonstrated were required in the biosynthesis of various rose-scent chemicals, among them geranyl acetate and germacrene D.

Those are just a few chemical pixels in the vast picture of floral scent. Nevertheless, Robert Raguso, a chemical ecologist at the University of South Carolina in Columbia, characterizes the pace of discovery in the field as explosive. "We are in this beautiful growth phase where everything is new... and worthwhile. Now, the most

interesting challenge is putting it together," says Raguso, who was a graduate student in Pichersky's lab in the early 1990s and whose work led to the discovery of the linalool synthase gene.

SCENT AWAY

Even as researchers uncover more of the molecular story behind floral scent, the goal of controlling how flowers smell remains elusive. The genetic and biochemical complexity of fragrance continues to thwart scientists. "Many attempts at [scent] engineering have been done, but so far there hasn't been a lot of success," says Dudareva.

Pichersky says that scent engineering would be useful for more than just pleasing human noses. For starters, he suggests that it will someday empower growers to choose the pollinators that visit specific plants and to replace some chemical pesticides with living pest controllers such as parasitic wasps.

In one approach to manipulating plants' biochemical pathways, a team of scientists in the Netherlands inserted into petunias the *C. breweri* gene for linalool synthase that Pichersky's team had discovered. The team, led by Harro Bouwmeester of Plant Research International in Wageningen, the Netherlands, confirmed that the transplanted gene was working and that the transgenic petunias were making linalool in their tissues, but the linalool never made it out of the plant.

A related project, led by Alexander Vainstein of Hebrew University in Rehovot, Israel, got a bit further. It produced trans-



PAPER GARDEN — As flower breeders have expanded the variety of colors among roses (previous page), the flowers' scents have diminished. In their initial work on engineering scents back into plants, scientists have enlisted the petunia (above), snapdragon (right), and a wildflower called *Clarkia breweri* (next page).

genic carnations that released linalool, but in amounts too small for a person to smell. While Raguso says that the aroma of linalool reminds him of Earl Grey tea, David Clark of the University of Florida in Gainesville describes the smell as "Fruit Loopy." Clark has been approaching scent engineering by manipulating the native genes of a single plant, a petunia, rather than transferring scent genes from one species to another. Using current techniques of genetic analysis and engineering, he intends to first identify genes that might play roles in petunia scent. Then, he'll either deactivate those genes or pump up their activity. His goal is to make the plants produce unusually small or large amounts of the enzymes encoded by the genes.

"We are just now figuring out where all of the pieces are in the pathways," says Clark. He notes that petunia fragrance emerges largely from 8 to 10 volatiles, each one created by the interplay of several enzymes and substrates. Manipulating the plant's fragrance with finesse, therefore, would require commandeering

several genes, a dauntingly difficult task since researchers are only sporadically successful at achieving a desired goal when engineering even single genes.

Roman Kaiser, director of the natural-scents research unit for the Geneva-based company Givaudan, favors studying, rather than manipulating, floral fragrances. However, he predicts that would-be fragrance engineers such as Pichersky, Clark, and Dudareva will eventually have their day.

The growing body of knowledge about floral scents is likely to have a bearing on the perfume industry as well as on flower sellers, Kaiser says. "I could imagine that

very special fragrance chemicals found in nature, but difficult to synthesize, might be produced by applying such techniques" in a way that improves the yield of these chemicals in the flowers that naturally make them, he says.

If researchers do approach a time when they can engineer flowers to have novel scents, they may discover, as have scientists in the genetically modified food business, that winning public support for such manipulations is the toughest challenge of all. Using genetic techniques to alter floral scent is, in Clark's words, "a double-edged sword."

Opponents of genetically engineered food may add scent-altered flowers to their list of products that could pose dangers. Consider a project in which agriculturally minded genetic researchers alter fragrance genes and the flower attracts different pollinators. "If we end up with a plant that is covered in flies, someone will say, 'This is a freak show,'" Clark predicts. Such a scenario could easily nip scent engineering in the bud, he says.

Even if future scent engineers can win over public opinion, they may have to contend with a host of low-tech factors that Silver Spring, Md.-florist Agnes suspects have a dulling effect on floral scent. He remembers fondly when he could buy all his flowers fresh from local greenhouses. "Now, I get my flowers from California, from Israel, Holland, all over the place," he says.

Flowers lose their scent while they're refrigerated during long journeys on planes and trucks, he says. And that could be a problem, even for high-tech flowers of the future. ■



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OF NOTE

ASTRONOMY

Keeping Hubble from being hobbled

With a repair mission seriously in doubt, time is starting to run out for the aging Hubble Space Telescope. Late last month, NASA took steps to conserve a key piece of equipment on the orbiting observatory. Engineers shut down one of Hubble's three gyros, devices that enable the telescope to point precisely toward a celestial target and maintain a steady gaze. Although the telescope normally uses all three gyros for this steering, the observatory can make do with two by relying on another device.

The agency estimates that, in the absence of a maintenance run, preserving the life of the third gyro could keep Hubble working through mid-2008, 8 months longer than otherwise expected. Earlier this year, after urging by Congress and the National Academy of Sciences, NASA reinstated a canceled shuttle mission that would install new gyros, batteries, and instruments in the observatory. However, NASA has delayed all upcoming shuttle missions after loose pieces of insulation hit the shuttle *Discovery* during a July flight, the first since the fatal flight of *Columbia* in February 2003. Damage to NASA equipment in Louisiana from Hurricane Katrina may further delay additional shuttle flights, and priority will be given to those missions servicing the International Space Station. —R.C.

ANIMAL SCIENCE

West Nile virus fells endangered condor

A cliff-dwelling California condor chick in Ventura County, Calif., died in late August from a West Nile virus infection. The chick is one of only four of its species born in the wild this year.

The 3-month-old bird's illness was complicated by pneumonia, according to the U.S. Fish and Wildlife Service (FWS), which is administering a recovery program for these highly endangered birds.

Knowing the species' vulnerability to West Nile virus, FWS scientists had inocu-

lated the chick's parents with a condor-specific West Nile vaccine in 2003 and 2004.

"We know through testing on captive condors that maternal immunity is transferred to the chicks," notes project leader for the recovery program Marc Weitzel of the FWS Hopper Mountain Complex outside Ventura, Calif. However, the team didn't expect that immunity to have worn off so soon.

Conservation scientists routinely vaccinate all adults of the species and chicks born in captivity as part of the recovery program. "We [now] will attempt to vaccinate wild-hatched chicks in their nests," says Weitzel.

Just 276 California condors survive. Roughly 150 live in captive-rearing programs at zoos and other centers. The rest are part of populations that were reintroduced to the wilds of California, Arizona, and Baja, Mexico, beginning more than a decade ago (*SN*: 1/25/92, p. 53). The imperiled species—whose population once had plummeted to just 27 individuals—began successfully reproducing in the wild 4 years ago (*SN*: 6/9/01, p. 357). —J.R.

ENVIRONMENT

Sow what? Climate reviews help farmers choose

African subsistence farmers are far likelier to leverage rainfall forecasts into better crop yields after attending workshops explaining the basis for the rain predictions, some of which include climatic events half a world away.

Anthony Patt of Boston University and his colleagues organized short workshops for a randomly chosen cross-section of subsistence growers—those who plant crops for their own consumption, not commerce—in several Zimbabwean villages. The workshops preceded planting seasons and explained the government's rain predictions, factors contributing to their uncertainty, and planting strategies that the farmers might adopt in response to the forecasts and uncertainties.

A major issue influencing the rain predictions, the workshop instructors explained, is the timing and severity of any recent El Niño, a prolonged period of warm surface waters in the west equatorial Pacific (*SN*: 8/17/02, p. 110).

In the Aug. 30 *Proceedings of the National Academy of Sciences*, Patt's group presents data from two villages for the 6-month growing season in two successive years. The first season's drought and second year's ample rains had been predicted fairly accurately.

Farmers who attended the workshops were several times more likely than others to have changed, in response to the forecasts, the timing of their planting or the crops they chose to plant. This proved especially beneficial, Patt notes, when the second year's forecast indicated that these normally dry villages might reasonably

gamble on planting crops, such as "long-season" maize, that need more water but hold the potential for much higher yields than the usual, shorter-season cultivar. Harvests by farmers who received workshop training were 20 percent greater in that rainier year than those of their peers who hadn't gone to the workshops. —J.R.



ILL FATED The chick that died of West Nile disease was a month older than the one pictured here.

BIOMEDICINE

Deaths in early 1918 heralded flu pandemic

An examination of New York City death records from early last century suggests that the world's deadliest flu virus was on the loose in New York several months before it exploded into the 1918–1919 global pandemic.

At the time, that foreknowledge wouldn't have averted the catastrophe that killed at least 40 million people worldwide, says Donald R. Olson of Columbia University. But nowadays, he adds, a "herald wave" of flu could provide crucial warning of an impending pandemic. "It would give us 6 to 7 months to produce and distribute vaccine," he says.

Olson and his colleagues calculated monthly death rates in all age groups in New York from 1911 to 1921 and found an unusual spike among young adults between February and April 1918. That group was hardest hit by the pandemic, which flu historians have argued began in Kansas and spread to New York and elsewhere in the fall of 1918. The number of deaths in each age group in the city in early 1918 was proportional to how heavily each group was affected by the pandemic, which began revving to full strength in New York in September.

The increased death rates in early 1918 must have resulted from an early and previously unrecognized wave of the pandemic, Olson's team proposes in the Aug. 2 *Proceedings of the National Academy of Sciences*.

With a virus that could cause the next flu pandemic now infecting birds across Asia, the U.S. government decided last week to spend \$100 million to stockpile an experimental flu vaccine. —B.H.

PLANETARY SCIENCE

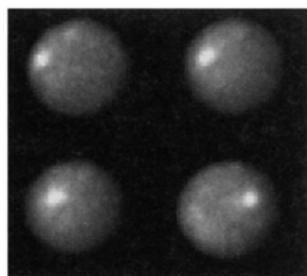
Icy world found inside asteroid

New observations of Ceres, the largest known asteroid, suggest that frozen water may account for as much as 25 percent of its interior. If this is true, the volume of ice on Ceres would be greater than that of all the fresh water on Earth.

The evidence comes from Hubble Space Telescope images showing that the 930-kilometer-wide asteroid is smooth and almost perfectly round. Simulations show that a body as massive as Ceres can have that shape and texture only if materials inside it have separated into layers of higher- and lower-density compounds. A period of heating and cooling, such as that experienced by the solar system's rocky inner planets, could have caused light material to move toward the asteroid's surface and denser material to sink.

In the Sept. 8 *Nature*, Peter Thomas of Cornell University and his colleagues suggest that the outer, low-density material is probably ice because Ceres' surface shows signs of water-bearing minerals and because the asteroid's overall density is lower than that of Earth's rocky crust. The proposed ice layer would lie just beneath a thin crust of clay and carbon-rich compounds and above a rocky core, the researchers say.

Ceres is one of several hundred thousand bodies that lie in the main asteroid belt between Mars and Jupiter. The layering provides new evidence that Ceres is a case of arrested development. It's "an embryonic planet" halted by Jupiter's gravity from packing on additional material to



CERES SERIES This sequence of Hubble images reveals a bright spot of unknown origin on Ceres during a quarter-turn of the asteroid's 9-hour rotation.

become a full-fledged planet, says study coauthor Lucy McFadden of the University of Maryland in College Park.

Next year, NASA plans to launch a mission called Dawn, which will orbit Ceres in 2015 and then move on to Vesta, the second-largest known asteroid. —R.C.

GENETICS

Genes tied to recent brain evolution

Two genes already known to influence brain size have undergone relatively recent, survival-enhancing modifications in people and appear to be still evolving, a research team reports.

Specific variants of these genes have spread quickly by natural selection, say Bruce T. Lahn of the University of Chicago and his colleagues, who published separate reports on each gene in the Sept. 9 *Science*.

The researchers examined DNA from 1,186 adults representing 59 populations worldwide and determined the frequency of specific variants of the two genes called *microcephalin* and *ASPM*.

A variant of *microcephalin* originated roughly 37,000 years ago and now appears in 7 of 10 people, the scientists conclude from comparisons of the gene's sequence for the different groups. Populations outside of sub-Saharan Africa most frequently possess this modified gene.

A distinctive *ASPM* variant arose approximately 5,800 years ago and now shows up in 3 of 10 people. It occurs most often in Europeans, North Africans, Middle Easterners, and South Asians.

The functions of these particular DNA alterations, including any potential influence on intelligence or reasoning, remain unknown. —B.B.

ENVIRONMENT

Liquid-detergent packets threaten children's eyes

Small sealed bags containing liquid detergent for single loads of laundry may be convenient, but if squeezed, they're liable to burst and spray their caustic contents into people's eyes, warns a team of physicians. Noel Horgan and other ophthalmologists at Children's University Hospital in Dublin, treated six children in as

many months for eye injuries that occurred while the youngsters were playing with the packets of liquid detergent.

Each of the children, ages 18 months to 3 years, was hospitalized for 2 to 5 days for chemical injuries to the surface of one or both corneas. In each case, parents had promptly flushed the child's eyes with water, which helped prevent permanent damage, the physicians report in the Aug. 13 *Lancet*.

Liquid-filled bags and solid detergent tablets, which dissolve in the wash, are marketed as alternatives to containers of powdered detergent. The single-load products already carry labels warning users to keep them away from children, who, the researchers say, are attracted to the squishy objects. —B.H.

SCIENCE & SOCIETY

Docs shy away from telling kids they're heavy

In 1980, about 1 in 20 U.S. children and teens was overweight. Today, that figure is closer to 1 in 6. Abetting this unhealthy trend appears to be reluctance by physicians to discuss weight with their young patients or parents.

Researchers with the National Center for Health Statistics in Hyattsville, Md., analyzed data that had been collected for 1,473 overweight children between 1999 and 2002 as part of a national health survey. The likelihood that a health professional had mentioned a weight problem varied with a child's age and ethnicity, according to a report by Cynthia L. Ogden and Carolyn J. Tabak in the Sept. 2 *Morbidity and Mortality Weekly Report*. Some 52 percent of adolescents ages 16 to 19 were warned about their unhealthy weights, but the rate declined with age. Only 17 percent of families with overweight children under 6 were warned.

Among all overweight girls, nearly half of the blacks represented in the survey had been told they were too heavy, compared with just 37 percent of Mexican-American girls and 31 percent of white girls. One reason for this ethnic discrepancy, Ogden notes, is that more of the black girls than of the others were in the most-extreme obesity category for their age. Doctors may be discussing weight with only the heaviest individuals in any age group, Ogden says.

The data have a message, she adds: Health professionals should be more proactive at discussing unhealthy weight in children of all ages. Young children, especially, could benefit, she says, because studies have shown that they're more receptive to suggestions that they increase physical activity and improve their eating patterns than older children are. —J.R.

THOMAS ET AL., NASA

Books

A selection of new and notable books of scientific interest

THE IG NOBEL PRIZES 2: An All-New Collection of the World's Unlikeliest Research

MARC ABRAHAMSON

Did you know that chickens prefer good-looking people to ugly ones? That the more radio airtime that country music gets in a city, the higher the suicide rate there? That women are more likely than men to eat food that has fallen on the floor? Now you do, and it's all thanks to the wonders of science. Author Abrahamson has a degree in applied mathematics, but his forte is in unearthing and sharing wacky, authentic research and technical accomplishment. This enterprise has given rise to 14 First Annual Ig Nobel Prize Ceremonies, so far, and, now, two books. Many studies described here have appeared in legitimate research journals yet address questions such as the effect of wearing wet underwear in Norway. Other items, each in a short-chapter format, celebrate the invention of karaoke and other achievements just as worthy of note. *Dutton, 2005, 270 p., b&w illus., hardcover, \$18.95.*



THE PTEROSAURS FROM DEEP TIME

DAVID M. UNWIN

The predator banks hard, its wings flexing under the load. Below, the orange plain gives way to a green marsh and then blue water. A sudden dive, a plunge, and long sharp jaws snag a rainbow-hued fish. The dragon has struck. Thus begins this thorough account of pterosaurs in all their prehistoric forms and glory. Unwin, the curator for fossil reptiles and birds of the Museum of Natural History in Berlin, describes how the first pterosaurs took wing some 220 million years ago. From there, a multitude of these dragons, as Unwin calls them, evolved and filled the skies until they perished about 65 million years ago. The level of detail in the book is reflected by an appendix listing more than 100 "valid pterosaur species" and eight "possibly valid species of uncertain relationships"—all organized according to family relationships. The text itself is remarkably detailed and meticulously referenced. The author includes dozens of illustrations of these bizarre creatures, maps, timelines, taxonomic trees, photos of fossils, and all manner of drawings to make clear how the animals could fly and capture prey. *PI Press, 2005, 347 p., color and b&w photos and illus., hardcover, \$39.95.*

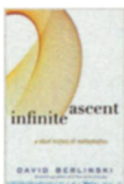


INFINITE ASCENT: A Short History of Mathematics

DAVID BERLINSKI

Over the long history of mathematical inquiry, certain achievements stand out. Mathematician-philosopher Berlinski focuses on 10 men whose work was important in its own right and as foundations for future insights. Beginning with the Greek

mathematician Pythagoras, who claimed numbers to be "the essence of all things," Berlinski concentrates on the work of scholars through modern times. Included are the creation of calculus by Isaac



Newton and Gottfried Leibniz, Leonhard Euler's explanation of complex numbers and exponential functions, and Evariste Galois' treatise on algebra and group theory. Berlinski also discusses the brilliance of Kurt Gödel's early-1900s proof that modern mathematics was incomplete and describes present-day mathematicians' focus on algorithms. The author presents personalities at every turn and includes historical details. Yet this book is dense with mathematical explanations, figures, and equations, and so is primarily for math enthusiasts. *Modern Library, 2005, 224 p., b&w illus., hardcover, \$21.95.*

THE SINGULARITY IS NEAR: When Humans Transcend Biology

RAY KURZWEIL

The Singularity is the point in the not-so-distant future when artificial and human intelligence will merge to create a type of superintelligence. Futurist and inventor Kurzweil writes that central to the realization of what he considers a new and improved human condition is the law of accelerating returns: Technological growth is exponential. After the Singularity, nanobots will replace the slow connections among people's brain cells with high-speed ones, the majority of human interactions will take place in virtual reality, and it will be possible to upload the contents of a human brain to a machine. Computers will emulate human intelligence and surpass it. In just under 500 pages, Kurzweil ponders topics including the prospect of extraterrestrial intelligence, surpassing the speed of light, and extending human life. Must reading for devotees of futurist literature, this weighty book may nevertheless appeal to a wider audience. *Viking Adult, 2005, 672 p., b&w illus., hardcover, \$29.95.*



SECRET LIVES OF COMMON BIRDS: Enjoying Bird Behavior through the Seasons

MARIE READ

It's nearly fall, and birds are building shelters, finding mates, and foraging for food to carry them through the winter. Nature writer and photographer Read elaborates on these activities as well as what occupies birds during the other three seasons. In spring, singing and nest building are priorities. Summer sees the birth of chicks, the care of the young by parents, and the opportunity for posing in the sun. Winter is the season of survival, with its challenge of obtaining food and water and of keeping warm. Read's beautiful photographs illustrate each of these activities and more, featuring birds from black-capped chickadees to double-crested cormorants. This is a small book, but each page features a striking color photograph that uses light and depth of field to create an intense natural image. *Houghton Mifflin, 2005, 96 p., color photos, paperback, \$14.95.*



LETTERS

Monkey see, monkey smell

That monkeys get "weirded out" by seeing themselves in mirrors doesn't seem unexpected ("Reflections of Primate Minds: Mirror images strike monkeys as special," *SN: 7/23/05, p. 53*). Were a familiar or an unfamiliar same-sex capuchin seen, the test subject would be bombarded not just by visual images but also by smells generated from the normal interactions of monkeys. What makes them act strangely is not seeing themselves, which they probably don't recognize, but seeing an image that has no smell.

DON BRADEN, BARSTOW, CALIF.

Digging dirt

I'm currently writing a biography of RAF Squadron Leader Roger Bushell, the instigator of the plan to construct the three tunnels in Stalag Luft III ("Seeing Past the Dirt," *SN: 7/30/05, p. 72*). Last fall, I visited the site. Amazingly, it was difficult to see where the excavation team had been. I have also spoken to dozens of men who either helped build the tunnel or were there when the mass escape occurred. The article stated that the escape was on March 26, 1944. However, it actually occurred on the evening of the 24th and into the wee hours of the 25th.

JENNIFER SCHWARTZ, AMES, IOWA

Little women

Regarding "From Famine, Schizophrenia: Starvation gives birth to personality disorder" (*SN: 8/6/05, p. 84*), while no obstetrician nowadays advocates starving expectant mothers, there was a general belief for many years that a pregnant woman should gain minimal weight. It might be of interest to know if this practice had any influence on the incidence of schizophrenia.

NELSON MARANS, SILVER SPRING, MD.

Correction "Multifaceted Mineral: Intense heat, pressure bear new form of silica" (*SN: 8/6/05, p. 84*) stated that "silica" makes up more than 60 percent of Earth's crust, but it takes silica, which is silicon dioxide, and related silicate minerals to amount to that proportion.

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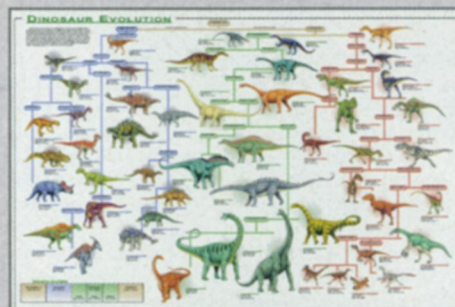


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