SCIENCE NEWS

THE WEEKLY NEWSMAGAZINE OF SCIENCE

MARCH 18, 2006 PAGES 161-176 VOL. 169, NO. 11

universal baby pics

superior stents

ultrasonic amphibians

building neural bridges

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night light

ILLUMINATION POLLUTES PARKS

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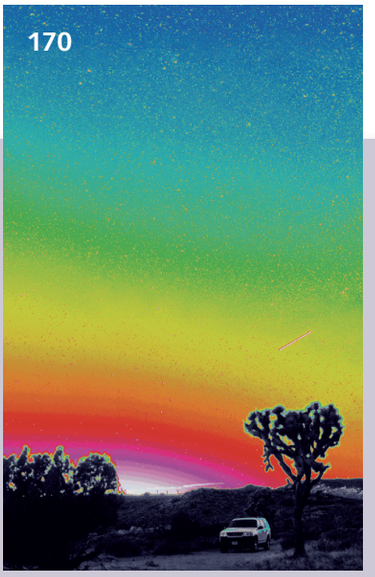

Features

This Week

Of Note

Departments

Cover Scientists are using digital photography to document nighttime light pollution in wilderness areas. In Joshua Tree National Park, Calif., illumination (in false color at left) from San Diego, Los Angeles, and smaller communities outshines the Milky Way (center). (Duriscoe *et al.*/NPS) Page 170

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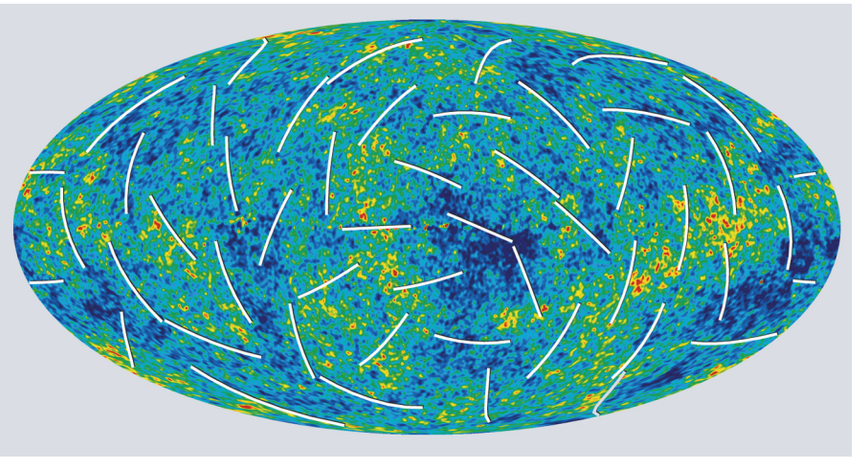
Cosmic Triumph

Satellite confirms birth theory of universe



WMAP SCIENCE TEAM, NASA

POLARIZED PICTURE New measurements of the polarization (white lines) of the radiation left over from the Big Bang, combined with a map of hot and cold spots in the background, support a leading theory about the birth of the universe.

The most detailed portrait ever taken of the radiation left over from the Big Bang provides fresh evidence that the universe began with a tremendous growth spurt, expanding from subatomic scales to the size of a grapefruit in less than a trillionth of a second.

In that instant, according to the theory known as inflation, microscopic fluctuations in the density of the cosmos were greatly amplified. That blueprint ultimately developed into the rich tapestry of stars and galaxies that fill the universe today. Although inflation has explained a multitude of features about the universe, before the new evidence, many details had yet to be scrutinized.

With the new information, "our basic cosmological model has been put to its most rigorous test, and it's thriving," says David N. Spergel of Princeton University. His team used the first 3 years of data gathered by NASA's Wilkinson Microwave Anisotropy Probe, which is examining the cosmic microwave background, the latent glow left over from the first moments of the universe. The probe and other telescopes see the radiation generated during the Big Bang as it appeared when it first streamed into space, a few hundred thousand years later.

At press time, the team planned to announce the findings in a telephone briefing.

Previous results from the satellite focused on the variations in the temperature of the microwave-background radiation, which has cooled over billions of years to a frigid 2.72 kelvins. Tiny variations in that temperature, less than a millionth of a kelvin hotter or colder, revealed details of the primordial density fluctuations that gave rise to stars and galaxies (*SN: 2/15/03, p. 99*). The new results focus on the polarization of the microwave-background radiation, the tendency of the radiation's waves to vibrate in a specific direction.

The polarization signal reveals that the first stars formed 300 to 400 million years after the Big Bang. That's slightly later than estimates that were based on earlier data from the same satellite, notes cosmologist Michael Turner of the University of Chicago.

Accounting for the polarization was like "removing a fog," says Spergel. It enabled the team to scrutinize more closely than ever before the primordial fluctuations imprinted on the microwave background.

According to the simplest model of inflation, the universe didn't balloon at a constant rate during the early growth spurt. As a consequence, variations in density of matter in the universe ought to be slightly larger on the largest scales—10 billion light-years—than on smaller scales—roughly 100 million light-years. The satellite has now found exactly that pattern, the team reports.

"This is not simply another test of inflation but something that examines the universe during its first trillionth of a trillionth of a second," says Turner. "The entire cosmology community has been waiting for this, excited and worried." The findings "are beginning to shed light on the mechanism [that drove] inflation," he adds.

The new data also confirm with unprecedented accuracy the ingredients of the universe: 4.4 percent ordinary matter, or atoms, 22 percent invisible material known as dark matter, and 74 percent a mysterious entity called dark energy. The satellite also pegs the age of the universe at 13.7 billion years. —R. COWEN

Stent Repair

Coated replacements better than radiation

Small mesh cylinders called stents, which doctors surgically implant to prop open clogged arteries, have a vexing tendency to become blocked soon after they're inserted. Stents can be cleared, but the only approved treatment for keeping a bare-metal stent from clogging again is the application of radiation directly inside the blood vessel.

Two U.S. studies now find that inserting a new, drug-coated stent inside the old one—like a sleeve inside a sleeve—keeps blood flowing better than zapping it with radiation does.

In recent decades, millions of people with blocked coronary arteries have avoided heart-bypass surgery by undergoing angioplasty, in which a doctor inflates a balloon-tipped catheter in a blocked artery to clear the obstruction. But angioplasty is only a temporary fix in many patients. The U.S. Food and Drug Administration approved the insertion, after angioplasty, of bare-metal stents in 1994 and drug-coated stents in 2003.

The move to stents has paid dividends, but within a few months after they are implanted, about 20 percent of bare-metal stents clog. The blockages are made up of cells and proteins similar to those that form a scab, says cardiologist Gregg W. Stone of Columbia University Medical Center, a researcher in one of the new studies.

Radioactive pellets inserted into a bare-metal stent impede cell growth and can keep blood flowing through the vessel more consistently than angioplasty alone can. "But radiation is cumbersome to use and expensive," says cardiologist David R. Holmes of the Mayo Clinic in Rochester, Minn., who coauthored the other study.

What's more, radiation sometimes contributes to a blockage by exacerbating vessel damage at the edges of the stent, Stone says.

Drug-coated stents discharge their cargo slowly over several weeks, the period when the vessel is still traumatized from angioplasty and at greatest risk of forming a clog inside the stent, says cardiologist David J. Moliterno of the University of

Kentucky in Lexington, who didn't participate in either of the new studies.

To compare the two treatments, the two research teams randomly assigned 780 people with blocked bare-metal stents to have angioplasty followed either by insertion of a second, coated stent or by radiation at the stent site.

The stent-in-stent approach proved better. Only 9 percent and 11 percent of stents laced with the drugs sirolimus (Rapamycin) and paclitaxel (Taxol), respectively, needed to be reopened during the two 9-month trials, the scientists report in the March 15 *Journal of the American Medical Association*. In patients receiving radiation, roughly twice as many stents required reopening during that time. The companies that make the two drug-coated stents sponsored the trials.

QUOTE

"Radiation is cumbersome to use and expensive."
DAVID R. HOLMES, Mayo Clinic

Coupled with earlier work, the new studies "establish the role of drug-[releasing] stents as the preferred treatment" for blocked bare-metal stents, says cardiologist Adnan Kastrati of the German Heart Center in Munich.

Some U.S. doctors are already using the stent-in-stent approach, Stone says.

In response to the new results, radiation treatment will probably fall into disuse, Stone and Holmes say. —N. SEPPA

Shaken but Not Stirred

Rock formations reveal past quakes' size limit

Dozens of precariously balanced rocks in southern California tell a story just by standing there: Earthquakes that have occurred on nearby faults in recent millennia haven't exceeded magnitude 7. Researchers developing seismic-hazard maps for that and other areas are pondering how such rocky evidence might best be incorporated into their next round of updates.

The Elsinore and San Jacinto fault zones lie about 35 kilometers apart and extend southeast from San Diego. In a 5-km-wide, 120-km-long swath centered between these faults, there are at least 60 rock formations that seem as if they'd topple with a modest jolt. Some of these stones are more than 2 meters tall, weigh a metric ton or more, and have been standing for many thousands of years, says Abdolrasool Anooshehpoor, a seismologist at the University of Nevada in Reno.

All the balancing stones are at least 14 km from the nearest fault, a hint that similar rocks closer to the faults have been toppled by past earthquakes, says Anooshehpoor. Field studies suggest that about 40 quakes of magnitude 6.5 or larger have occurred along fault zones in the region in the past 10,000 years, but the standing stones suggest that there's an upper limit to the size of those temblors.

Anooshehpoor and his colleagues estimated the stability of a dozen of the standing stones by analyzing their sizes and shapes. They found that, on average, ground motions with a side-to-side acceleration measuring about 30 percent of that of Earth's gravity would topple the rocks. A magnitude 7 or larger quake on those nearby faults would cause such vibrations, the researchers report in the March *Geology*.

Current estimates of seismic risk for the region suggest that ground motions large enough to topple the rocks occur, on average, every 2,500 years. However, the presence of so many precariously balanced rocks indicates that such motions are less frequent, says Anooshehpoor.

Previous estimates have included the possibility of large earthquakes occurring on previously unknown faults because other regions have been struck by such quakes, including the magnitude 6.7 quake that struck Northridge, Calif., in January 1994, says Mark D. Petersen, a seismologist at the U.S. Geological Survey in Golden, Colo. The information derived from the balanced rocks suggests that there are no active unknown faults near the San Jacinto and Elsinore faults. —S. PERKINS

STILL STANDING **Analyses of this 1.3-meter-tall stone southeast of Riverside, Calif., and other precariously balanced rocks suggest that recent earthquakes on nearby faults haven't exceeded magnitude 7.**

J. BRUNE ET AL.

Networking with Friends

Nanotech material reconnects severed neurons

A new material made of nanometer-size protein particles appears to be capable of bridging the gap between severed nerves. The finding could lead to an effective early treatment for spinal cord injuries, traumatic brain injuries, or strokes—conditions that affect millions of people worldwide.

When these injuries damage the long arms, or axons, that join neurons, the surrounding cells form scar tissue in the fissure. This blocks neural connections. Few therapies have been successful in reinstating these lost connections in people, says Rutledge G. Ellis-Behnke, a neuroscientist at the Massachusetts Institute of Technology (MIT).

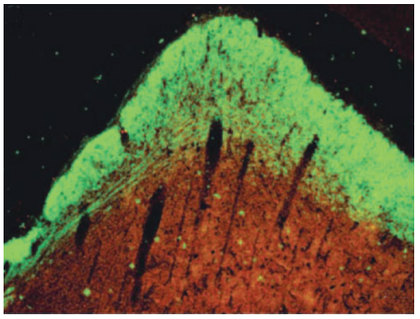
"What our research looks at is how to restore quality of life to these people," he says. "It may be as simple as being able to reconnect these disconnects in the brain."

Seeking such reconnections, the scientists designed a synthetic chemical to act as a temporary scaffold to support neurons as they grow extensions across the gaps in severed axons. This material, which the team named the self-assembling peptide nanofiber scaffold (SAPNS), is made up of particles of protein. The material forms a mesh when mixed with the fluid that permeates the brain.

Ellis-Behnke's team tested SAPNS on damaged nerves in hamsters. The researchers first severed one of each animal's optic nerves, rendering all the hamsters blind in one eye. Immediately following this operation, some of the animals received an injection of the scaffold material where the nerve was severed. Other animals received an injection of saline.

Three months after the surgery, the scientists tested the animals' vision. Although no hamster that received saline showed any sign of vision in its eye on the side with the damaged optic nerve, about 75 percent of animals that received SAPNS regained some vision, as indicated by turning their heads when offered a treat on their formerly blind side.

When scientists peered into the animals' brains, they found that the saline-injected hamsters had extensive scar tissue where the nerve was severed. However, in those animals that had received SAPNS, there was no visible scar tissue. "It actually looks like the tissue knit itself together into one continuous piece," says Ellis-Behnke. His team reports the results in an upcoming *Proceedings of the National Academy of Sciences*.



REPAIR POTENTIAL Severed nerve cells showed new growth (green) in brain tissue of hamsters treated with a nanotech chemical.

Ellis-Behnke notes that he and his collaborators still need to answer several questions about how SAPNS works. For example, it's unclear whether the material would have a similar effect if administered hours or days after nerve damage occurs, a more realistic scenario for most injuries in people.

Once scientists iron out these wrinkles, SAPNS or a related chemical could offer new ways to repair brain damage, says Edward J. Tehovnik, an MIT neuroscientist who didn't participate in the study. "The work has the potential of opening up a new field of study in the area of nanotechnology and brain repair," he says. —C. BROWNLEE

Grown-Up Connections

Mice, monkeys remake brain links as adults

Two new studies raise the bar on estimates of the magnitude of changes in nerve connections in the brain's outer layer, or cortex, during adulthood. Cells' anchor points for these neural connections undergo substantial adjustments in the absence of training, scientists say.

Both reports, one on mice and the other on monkeys, appear in the March 16 *Neuron*.

The first investigation, directed by neuroscientist Karel Svoboda of Cold Spring Harbor (N.Y.) Laboratory, examined 27 adult mice that had been genetically modified to produce a cell-labeling substance. The label enabled researchers to obtain images of message-bearing cell extensions, or axons, in the cortex. The imaging relied on a technique that uses infrared light to penetrate deep into the brain. The team probed each animal's axons every 4 days, over periods ranging from 24 days to 9 months. The animals received no training during the experiment.

The overall structure, length, and number of axons in the animals' brains remained largely stable, Svoboda's team reports.

However, when the scientists examined synapses, the connections where nerve cells pass signals, cortical axons lost old synapses and formed new ones at greatly varying rates.

Axons that branched up from the thalamus, below the cortex, incurred few synaptic losses or gains. In contrast, axons that originated in nearby cortical regions displayed dramatic synaptic changes. In one cortical-axon group, one-fifth of the synapses that the researchers tracked had been replaced after 1 week. That proportion reached one-half after a month and about three-quarters by 9 months.

The entire population of synapses connected to certain groups of axons gets replaced many times during an animal's life, Svoboda and his colleagues propose.

"Nothing could have prepared us for the prodigious rate of turnover" of synapses on those axons, remarks neuroscientist Edward M. Callaway of the Salk Institute for Biological Studies in La Jolla, Calif.

In the second study, a group led by neuroscientist Charles D. Gilbert of Rockefeller University in New York City used the same synapse-imaging technique to examine the gateway for visual information in the cortexes of two adult macaque monkeys for 2 weeks.

Researchers have long regarded this brain area, the primary visual cortex, as relatively resistant to change. However, axons in this area lost synapses at a weekly rate of about 7 percent and formed new ones at a comparable pace, Gilbert and his coworkers report.

They have yet to determine whether synaptic turnover occurs more frequently in certain classes of monkey axons. The rate of synaptic losses and gains on these axons probably rises further as adult monkeys learn various perceptual tasks, the scientists propose. The monkeys in the study had received no perceptual training.

Both new investigations build on mouse studies, also conducted by Svoboda's group, finding that dendritic spines—which receive messages from axons across synapses—come and go at a rapid clip, 30 percent replacement each month.

It will take further work to determine whether cortical cells with high rates of synaptic turnover orchestrate flexible adaptations to an animal's changing environment, Callaway says. —B. BOWER

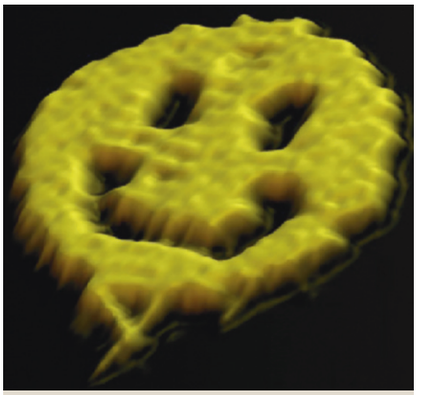
Can You Hear Me Now?

Frogs in roaring streams use ultrasonic calls

A small frog species from China is the first amphibian shown to use ultrasonic calls, says an international research team.

Equipment designed for studying bats picked up high-pitched chirrups in the calls of the concave-eared torrent frog *Amolops tormotus*, says Albert S. Feng of the University of Illinois at Urbana-Champaign. He and his colleagues also measured nerve activity in the hearing centers of the frog brains in response to ultrasonic tones.

The small brown frogs live beside water splashing over rocks on a mountainside. Ultrasonic perception may have developed as the frogs struggled to hear each



PNAS; ROTHEMUND AND N. PAPADAKIS

The art of the fold

Behind this simple grin is one of the most complex nanostructures ever made. To construct this 100-nanometer-wide smiley face, computer scientist Paul Rothemund of the California Institute of Technology in Pasadena improved on a technique known as DNA origami. In it, a single-helix strand of synthesized DNA is folded into a loose geometric shape and held in place with a few short strands of DNA. By weaving many more short "staple strands" of DNA into the long strand's scaffold, Rothemund bound the DNA into a tight, mazelike pattern. With this technique, he created several shapes that are "10 times as complex and several times bigger" than previous DNA origami designs, Rothemund reports in the March 16 *Nature*. —C. GRAMLING

other over the din, the researchers suggest in the March 16 *Nature*.

High-pitched signaling is "absolutely unexpected," says Michael Ryan of the University of Texas at Austin, who studies frogs and frog-eating bats.

The Chinese frog calls in a wide range of frequencies, including those that people hear. The frog sounds like a bird, says Feng. The species made headlines in 2002 for its diverse whistles and chirps (*SN: 9/14/02, p. 173*).

While studying sonograms of the calls, Feng and his colleagues noticed strong bursts above 20 kilohertz, which people can't hear. Tests showed that these bursts were in a range higher than the water's roar.

Such high-pitched sounds don't mean much by themselves. "If you scratch a table, there are lots of ultrasonic elements," says Ryan.

So, to see whether the frogs could actually hear the sounds, Feng and his colleagues visited the frogs' home at China's Huangshan Hot Springs in 2005. The researchers played various segments of a recorded frog call. When they broadcast just the ultrasonic section, a male frog called immediately after the burst. Several other males seemed to respond, but with less-precise timing.

Such responses were "suggestive" that frogs use ultrasound, says Ryan. What he found more convincing, he says, were measurements of nerve activity.

The researchers inserted electrodes into the part of the frog brain involved in hearing and found that the frogs are sensitive to sounds up to 34 kHz, says Feng.

"I think that the results are both surprising ... and robust," says Carl Gerhardt of the University of Missouri at Columbia. Frog hearing is usually confined to much lower frequencies than other vertebrates', he says.

SQUEAKING FROGS The male concave-eared torrent frog can hear extraordinarily high frequencies with its unusual, recessed ear (arrow and inset), an advantage for life in a noisy place.

The high-pitched calls may solve a long-standing question that Feng has had: Why did males evolve unusual, recessed ears? Now, Feng speculates that the structures improve sensitivity to high pitches. —S. MILIUS

Science's New Guard

Winners of annual competition get honors and hefty scholarships

An 18-year-old from Utah has been crowned sovereign of high school science. Shannon Lisa Babb of American Fork High School earned recognition and a lucrative scholarship for her 6-month investigation of water quality. Her project was one of 40 honored this week in the annual Intel Science Talent Search (STS).

Babb conducted monthly testing at seven sites along the Spanish Fork River and its tributaries. She found that nitrate, phosphorus, sediment, and other substances make it the most polluted river flowing into Utah Lake.

The second-place prize went to Yi Sun, 17, of the Harker School in San Jose, Calif., for developing a mathematical formula that describes particles in random motion. His research could be applied to photons moving within stars or to polymers that grow like vines around another object.

Yuan "Chelsea" Zhang, 17, of Montgomery Blair High School in Silver Spring, Md., took third place for demonstrating that certain by-products of low-density lipoproteins cause artery cells to increase production of a sticky molecule that may contribute to vessel blockages. Her finding suggests potential targets for drugs that combat atherosclerosis.

Those top three winners will receive scholarships of $100,000, $75,000, and $50,000, respectively, from contest sponsor Intel Corp. of Santa Clara, Calif. Science Service, which publishes *Science News*, administered the contest, as it has since 1942.

At a March 14 awards banquet in Washington, D.C., Intel chairman Craig Barrett congratulated each finalist. "The talent represented at Intel STS is a dramatic illustration that investing in science and math education will pay great dividends for the future of American innovation," Barrett said.

Students placing fourth, fifth, and sixth will receive $25,000 scholarships, while four other top competitors will each get $20,000 toward educational expenses. The remaining 30 finalists in the competition (*SN: 1/28/06, p. 54*) will each get $5,000, and all finalists will take home a notebook computer.

The other winners in the top 10 were, in order:

Nicholas Michael Wage, 17, of Appleton High School East in Wisconsin, who studied the properties of networks known as Paley graphs.

Jerrold Alexander Lieblich, 17, of Ward Melville High School in East Setauket, N.Y., who found that the brain processes a spoken word even when a person is tricked into perceiving a different sound.

David Bruce Kelley, 18, of Highland High School in New York, who determined that liquid neon is not the ideal medium for a neutrino detector.

Myers Abraham Davis, 17, of Baltimore Polytechnic Institute in Maryland, who developed a method that could permit computers to study particle collisions and process video game graphics more efficiently.

Adam Ross Solomon, 16, of John F. Kennedy High School in Bellmore, N.Y., who improved on methods of assessing the age of brown dwarf stars from their near-infrared spectra.

WATER WORK Shannon Babb won the Intel Science Talent Search for studying pollution in Utah's Spanish Fork River.

Evan Scott Gawlik, 17, of Texas Academy of Mathematics & Science in Denton, who used computational chemistry to investigate what he calls the "exceptions to the rule" that noble gases don't form chemical bonds.

Kimberly Megan Scott, 17, of Wellesley High School in Wellesley Hills, Mass., whose study of algebraic rules for distinguishing different objects could have applications in computer science. —B. HARDER

FENG AND M. KOWALCZYK; (INSET) FENG, B. GOLDBERG

What can we know about the Jesus of history?

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About Your Professor

Dr. Bart D. Ehrman (Ph.D., Princeton Theological Seminary) is the James A. Gray Professor and Chair of the Department of Religious Studies at The University of North Carolina at Chapel Hill. He has won several teaching awards, including the Students' Undergraduate Teaching Award and the Bowman and Gordon Gray Award for Excellence in Teaching. Professor Ehrman has written or edited 12 books.

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The Last Supper by Leonardo da Vinci, c.1495–98

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Medications for depressed kids spark scientific dispute

BY BRUCE BOWER

Among medications, antidepressants take the prize for inciting public and media mood swings. Whether celebrated as depression-busting happy pills or dismissed as overrated and apt to cause dangerous side effects, selective serotonin reuptake inhibitors (SSRIs) have taken pharmaceutical firms on a financial joy ride. Since their U.S. introduction in 1989, they've become the best-selling medication of any kind, reaping an estimated $10 billion annually in worldwide sales. Roughly one adult in eight has tried an SSRI in the past decade.

The seven currently marketed SSRIs are frequently prescribed to people diagnosed with major depression or with anxiety ailments such as obsessive-compulsive disorder or social phobia. Increasing numbers of depressed children and teenagers take SSRIs. Use of antidepressants among youngsters ages 5 to 17 increased from about 2 percent of that population in 1994 to almost 6 percent in 2002. This rapid expansion has served up a heavy dose of scientific debate mixed with regulatory scrutiny.

U.S. and British regulatory agencies approved one SSRI, fluoxetine (Prozac), for children and adolescents in 2003. The next year, however, the Food and Drug Administration responded to concerns that SSRIs cause youngsters to contemplate suicide or to kill themselves. The agency reviewed 24 studies of children and teens with major depression or other psychiatric disorders treated for 1 to 4 months either with one of nine antidepressant drugs, including SSRIs, or placebo pills.

On average, across the reviewed studies, 4 percent of patients taking antidepressants—mostly SSRIs—reported suicidal thoughts or acts compared with 2 percent of those taking placebos. Yet weekly questionnaires filled out by patients in 17 studies indicated that medication neither inflamed longstanding suicidal tendencies nor created them in people who had never considered killing themselves. Reasons for the discrepancy are unclear.

In March 2004, FDA officials issued a label for antidepressant containers warning that the medications may prompt young people to contemplate and try to commit suicide. Around the same time, a medical commission England tightened guidelines for using SSRIs and other antidepressants in adults, recommending the drugs only for the initial treatment of moderate-to-severe depression, preferably in combination with psychotherapy.

These developments reflect growing public concern with potential side effects of SSRIs and the way such drugs are tested and regulated, says psychiatrist Klaus P. Ebmeier of the University of Edinburgh in Scotland.

Some researchers doubt that SSRIs work as well as many psychiatrists and pharmaceutical firms claim they do. "The data for antidepressants' efficacy over and above that of placebos are not so compelling," says neuroscientist Amir Raz of Columbia University in New York City. No one knows the long-term effects of these drugs on developing brains, he adds.

Given the potentially fatal consequences of leaving depression untreated, many psychiatrists regard mounting worries about SSRIs as excessive. "Public fears that drug treatment for depression is worse than the illness itself may lead to untreated depression and more suicide," says Darrell A. Regier, director of research for the American Psychiatric Association in Washington, D.C.

All that controversy swirls around a towering problem. An estimated 1.5 million 12- to 18-year-olds in the United States, roughly 2 percent of that age group, experience major depression. That total dwarfs the number of mental-health clinicians qualified to treat them. Only around 7,000 psychiatrists in this country have been trained to treat children and adolescents.

DRUG PATROL Reports of adults whose suicidal thoughts and behaviors emerged or worsened during SSRI treatment began to appear in medical journals in 1990. A medical task force assembled by the American College of Neuropsychopharmacology (ACNP) examined those reports in 1993. It concluded that the available scientific evidence raised no red flags about SSRIs' promoting or causing suicide but added that clinicians should monitor drug-treated suicidal patients closely.

> "The data for antidepressants' efficacy over and above that of placebos are not so compelling."
>
> — AMIR RAZ, COLUMBIA UNIVERSITY

A second ACNP task force has now conducted a follow-up review and reached similar conclusions for depressed children and adolescents. Its findings appear in the March *Neuropsychopharmacology*. After analyzing British and U.S. clinical studies that relied on questionnaires, the task force noted that individuals prescribed SSRIs reported slightly more instances of suicidal thinking and suicide attempts than placebo-treated peers did. But these figures varied considerably from one trial to another, suggesting that the questionnaires inaccurately measured suicidal tendencies, says psychiatrist and task force chair J. John Mann of Columbia University.

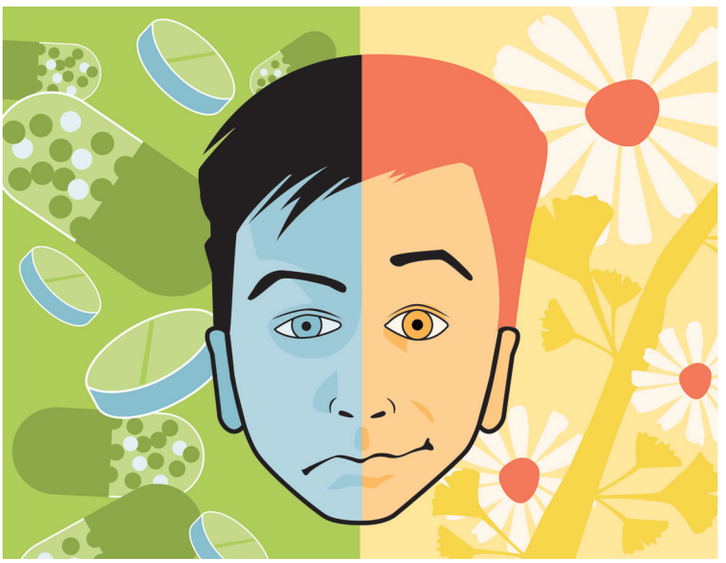
Other lines of evidence cited by Mann and his colleagues suggest that SSRIs don't foster suicide and may instead prevent it. For example, a dramatic increase in the number of SSRI prescriptions for teens over the past 15 years coincided with an average decline of 33 percent in youth-suicide rates in the United States and 14 other countries.

Also, studies of teens and adults who have killed themselves—including an analysis of nearly 15,000 suicides in Sweden—rarely find traces of SSRIs or other antidepressants in blood, even among those who were depressed.

Suicidal thoughts and attempts in depressed children and adolescents escalate in the month before starting SSRI treatment and progressively decline in the 6 months after initiating SSRI use, say psychiatrist Gregory E. Simon of Group Health Cooperative in Seattle and his colleagues. Their study, considered by Mann and his colleagues before its publication, appeared in the January *American Journal of Psychiatry*.

Simon's team identified 82,285 episodes of treatment with SSRIs or any of several other antidepressant drugs among 65,103 health-plan members. Patients age 17 years or younger accounted for 5,107 treatment episodes, each of which was tracked by the researchers for 6 months. Treatment occurred between 1992 and 2003.

Overall, 31 people of any age killed themselves—a far lower proportion of depressed patients than occurs without antidepressant treatment—and 76 made suicide attempts that landed them in the hospital.



Among the cases examined, attempted suicide occurred more often among teens than among adults in the month before starting treatment. In both age groups, the rates of completed and attempted suicides were about 60 percent lower during antidepressant treatment.

Still, large studies using random assignment to various SSRIs or a placebo are needed to establish whether particular drugs cause suicide attempts in certain patients, Simon says.

One such study compared 439 depressed youngsters assigned to receive Prozac or a placebo with or without 4 months of cognitive-behavioral therapy, a form of psychotherapy that focuses on reversing negative thinking and setting new goals (*SN: 8/21/04, p. 116*). The test found that, for moderate-to-severe depression, many youngsters improved markedly with a combination of Prozac and psychotherapy, and Prozac alone worked nearly as well.

In this investigation, dubbed the Treatment for Adolescents with Depression Study (TADS), rates of suicidal thoughts dropped in all four groups, although only the combination of Prozac and psychotherapy proved superior to placebos in this respect.

These studies remain incomplete. Drug companies have yet to release unpublished data from some clinical trials requested by the ACNP task force, Regier notes. Political pressure is building to require the release of unpublished results.

PLACEBO POWER One major theme emerging from studies of depression treatment, according to Raz, is that SSRIs and related medications relieve depression only slightly better than placebo pills do. For example, the ACNP task force recommends Prozac as a depression treatment in youth because it showed statistical superiority to placebo pills in 3 of 15 clinical trials. No other SSRI or older antidepressant outperformed placebos in more than one of the clinical trials that the group examined.

The TADS study was more encouraging. Many of the depressed teens improved markedly with a combination of Prozac and cognitive-behavioral therapy or Prozac alone. Fewer responded to the psychotherapy alone or to placebo pills.

Yet many studies of drug treatment for depressed children and teenagers show small, if any, benefits of SSRIs over placebos, Raz concludes in a research review published in the January *PLoS Medicine*.

Psychologist David O. Antonuccio of the University of Nevada School of Medicine in Reno also stresses placebo power. In a 2004 analysis of nine clinical trials of SSRIs and other antidepressants prescribed to depressed youngsters, he and psychologist Irving Kirsch of the University of Plymouth, England, concluded that placebos worked 88 percent as well as active medication did.

A second analysis conducted by Kirsch and psychiatrist Joanna Moncrieff of University College, London, found that placebos achieved 80 percent of the antidepressant response observed in adults. That investigation was reported in the July 16, 2005 *British Medical Journal*.

These two studies have generated controversy in psychiatric circles. Psychiatrist Michael E. Thase of the University of Pittsburgh Medical Center and others argue that antidepressants' narrow margin of superiority over placebos often translates into substantial gains in daily functioning for those with moderate-to-severe depression, especially as treatment extends beyond the few months allotted for clinical trials. Thase also points out that the TADS results illustrate the clout of combining SSRIs with psychotherapy.

Raz responds that volunteers in the TADS investigation knew whether or not they were getting psychotherapy. Depressed teens may have expected to feel better when given a treatment that they knew was genuine, he proposes.

Furthermore, Raz contends that the drugs' superiority, assessed in the various studies by using a standard rating scale of depression symptoms, may qualify as statistically significant even when that advantage doesn't translate into significant improvements in a person's daily functioning. The absence of clear criteria for identifying life-changing upgrades in mood and behavior generates scientific confusion, in his view.

There's little information available about the long-term effects of SSRIs. Animal studies suggest that serotonin, the neurotransmitter targeted by SSRIs, assists in early brain development, especially in areas involved in anxiety responses. Mouse studies indicate that exposure to Prozac in infancy leads to excessive fear and anxiety in adulthood.

It's far from clear precisely how SSRIs act in the brain, Raz adds. Although the drugs reduce serotonin's availability for performing its various duties, that effect can influence the activity of other neurotransmitters.

Only more studies over many years will determine whether youngsters prescribed SSRIs develop an increased vulnerability to anxiety disorders later in life, Raz says.

There's no guarantee, however, that future investigations will settle this issue. The pharmaceutical industry's vast influence on biomedical research includes its funding of clinical trials of SSRIs and financial support for most psychiatric researchers via grants,

(continued on page 172)

ISTOCKPHOTO

LIGHT ALL NIGHT

New images quantify a nocturnal pollutant

BY BEN HARDER

Ansel Adams once called his photography of the nation's parklands a "blazing poetry of the real." If scientific data were verse, that description would also fit Chad Moore's pictures. Taken in dozens of national parks, mostly in the western United States, Moore's images emphasize contrast, horizon, and sky. But they aren't imitations of Adams' art. In the name of science, Moore photographs the darkness, but his subject may be in peril.

Moore's data demonstrate that artificial light from urban areas penetrates deep into some of America's most remote, wild places. For species and ecosystems that have evolved with a nightly quota of darkness, light pollution can be a force of ecological disruption, other research has suggested. With the new images, ecologists can identify geographic areas where sensitive species are most likely to be affected. The inventory of images also provides a reference point for measuring future changes in light pollution, Moore says.

Most of this light originates in cities as illumination from buildings and streets. Light reflects off moisture and dust in the air, creating "sky glow," says ecologist Travis Longcore of the Urban Wildlands Group in Los Angeles. In some places, it obscures the starlight.

Depending on the light's intensity, the cloud cover, and other factors, a city's sky glow may be visible hundreds of kilometers away, says Moore. At such distances, the curvature of Earth can obscure whatever buildings and structures originally emitted the light. Extending from the city in all directions, the light from Las Vegas, for example, reaches 8 of 38 parks that Moore has surveyed.

About 150 km away from Las Vegas, the city's lights are the dominant cause of light pollution in Death Valley National Park, where Moore's collaborator Dan Duriscoe works. On the other hand, "we can barely detect Las Vegas from Bryce Canyon," about 300 km away, says Moore, who's based in Utah at that national park.

Some images created by Moore and Duriscoe appear here for the first time in print. The physical scientists published other new pictures this week at *www2.nature.nps.gov/air/lightscapes*.

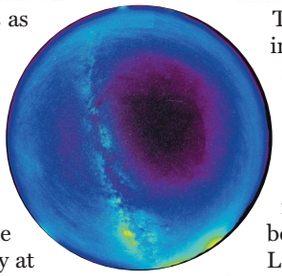
Moore and Duriscoe gathered their data with a commercially available astronomical-grade camera that they've customized. From a stationary position, their automated digital camera photographs every corner of the sky by taking at least 45 overlapping exposures in about half an hour.

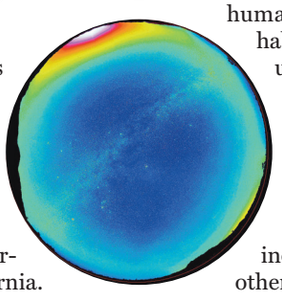
On a computer, Duriscoe weaves together the exposures to form a single mosaic of the heavens. In some images, he then enhances the contrast with false color to show bright light in white, reds, and oranges and near darkness in cooler shades. The resulting data set can be displayed as a panorama or in fish-eye–view format.

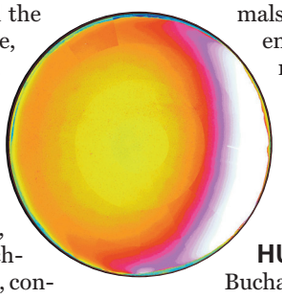
"You can think of each pixel as a cell in a spreadsheet," Moore says.

These photos can quantify, for example, the light shining on Nevada's Great Basin National Park (top photo this page). The slight glow from Las Vegas, more than 300 km to the south, is one of the most prominent features in that park's firmament on a moonless night. Yet, Great Basin, says Moore, "is as close as we have gotten to pristine.

At most of the sites that the researchers have surveyed, nearer and often brighter sources of light abound. Compared with the total illumination documented at Great Basin, a site called Government Wash (third photo from top) in Lake Mead National Recreation Area in Nevada showed about 10 times as much light, Duriscoe notes. "The brightest part of the sky at Great Basin equals the darkest part of the sky at Government Wash," he says.







VANISHING ACTS For now, a gap remains between the new measurements of artificial light and documentation of its biological effects. But effects may be afoot. For example, the disappearance of several populations of snakes in the increasing glow of the southern California skyline hints at light as the culprit.

Decades ago, the California glossy snake was perhaps the most abundant reptile in southern California. But habitat destruction and other threats pushed the wide-ranging, nocturnal species into steep decline, according to zoologist Robert Fisher of the U.S. Geological Survey in San Diego.

"We've gone back to places where it was widespread, and we can't find it in most of those places," he says.

To conduct a rough census of snakes in undeveloped areas near San Diego and Los Angeles, Fisher and his USGS colleague Ted Case set catch-and-release traps in nature reserves that have large, contiguous areas not traversed by roads.

In many such places, the researchers collected large numbers of diurnal snakes that need essentially the same habitat and range as the nocturnal California glossy does. But the glossies were gone.

"The reserves seem large enough to maintain them, but they don't seem to be there," Fisher says. The problem, he suggests, must be "some external factor."

A major candidate is light, he says.

The researchers found healthy populations of glossies in two remnants of the snake's former range. Each spot—El Monte Canyon and Camp Pendleton—is largely shielded from the lights of the region's urban centers by a combination of topography and distance, Fisher says.

Also in southern California, the western long-nosed snake appears to be declining, at least in part because of light pollution, Fisher and Case note.

Light may be edging out the snakes even where humanmade structures have not encroached on their habitat. "It might be that you can protect the land, but unless you can control the light levels that are invading the land, you're not going to be able to protect some of the species," Fisher says.

He presents some of the data that he and Case collected in a chapter in *Ecological Consequences of Artificial Night Lighting* (Island Press, 2006).

That new volume, edited by Longcore and Catherine Rich, also of the Urban Wildlands Group, devotes other chapters to the effects of light pollution on mammals, birds, fishes, and invertebrates. Contributing scientists note, for example, that light may interfere with mating activity among diverse nocturnal species, disrupt moth predation by bats, and discourage zooplankton from feeding on algae.

Four years ago, Rich and Longcore organized the first conference on ecological effects of light pollution (*SN: 4/20/2002, p. 248*).

HUNKERED DOWN In a recent survey, Bryant Buchanan and Sharon Wise of Utica College in New York strung up lines of white Christmas lights in woodlands in rural Virginia. They switched on the lights at dusk and scoured the illuminated tracts for red-backed salamanders, which are common nocturnal insectivores that hide when they're not hunt-

ing. The researchers also counted salamanders in nearby tracts that weren't lit.

During the first 2 hours after nightfall, the researchers found that more salamanders were active in the darker areas than in the lit ones. Later in the night, that difference disappeared.

About 0.01 lux of light struck the forest floor in the lit areas during the experiment. That's more than the amount shed onto the ground by the moon but less than natural twilight provides, Buchanan and Wise note in a chapter of the recent book.

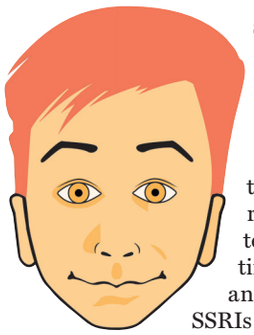
If such modest illumination can delay salamanders' nightly feeding excursions, Wise says, then "artificial night lighting has the potential to shorten foraging periods, limit food intake, and depress rates of growth, reproduction, and survival."

Red-backed salamanders are far from endangered. But rarer species might also hunker down when lights are bright, Wise says. Decades-old research shows that diverse amphibians calibrate their activity to the moon's cycles and that they're least active when the moon is brightest.

NOT AS DARK AS NIGHT – Sky glow from nearby Moab, Utah and Grand Junction, Colo., brightens the night sky at Arches National Park (*across pages 170 & 171*).
FULL DOME – Composite images (*page 171*) of the entire sky encircled by the horizon show the intensity of Las Vegas' lights in three national parks. From top to bottom: Las Vegas glows on the horizon far to the south of Great Basin National Park; the city is closer to and to the north of California's Mojave National Preserve; and it's still closer to and to the west (right side of image) of Government Wash in Lake Mead National Recreation Area, Nev.
BLAZING DATA At Racetrack Playa (*below*) in Death Valley National Park, the Milky Way blends into light pollution from Las Vegas and the greater Los Angeles basin.
ALL IMAGES C/O DURISCOE ET AL./NPS

At the most light-polluted sites where Moore and Duriscoe have collected data, sky glow outshines the moon for nearly half of each month. ■

(continued from page 169)



speaking fees, and consulting arrangements. Consider that, at the end of the group's report, 10 of 11 members of the ACNP task force list financial ties to pharmaceutical firms.

This influence will probably continue to emphasize positive over negative results, in Raz's view. For example, a team led by psychologist Craig J. Whittington combined data from published and unpublished clinical trials of five SSRIs prescribed to depressed children and adolescents. The group obtained the unpublished data from government regulators in England.

Taken together, the findings indicated that only Prozac outperformed placebos and that participants taking the placebos and Prozac had slightly lower rates of suicidal thoughts and attempts than those taking other SSRIs had. However, the researchers reported in 2004, the unpublished reports presented a less favorable view of the drugs' actions than the published work did. This raises the disturbing possibility that pharmaceutical companies have held back data that reflect poorly on their drugs, Raz says.

"The placebo effect can teach us a great deal about how to tailor depression treatments to those individuals who are placebo responders," he says. Approaches such as exercise and diet should be examined as possible alternatives for these people, Raz suggests.

IN THE TRENCHES As conflict rages over SSRI treatment for depressed kids, clinicians face hard choices about how to assist young people in emotional turmoil.

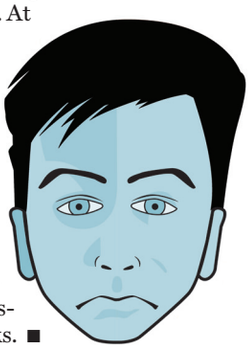
Psychiatrist Leon Hoffman directs the Pacella Parent Child Center in New York City. "In my experience, depressed kids often get better with psychotherapy alone," Hoffman says. "If a child is suicidal, I'll think about prescribing medication."

A new review of 35 studies of youth-depression treatments that didn't include drugs indicates that various psychotherapies yield substantial improvement, compared with relaxation training or other placebolike regimens. These effects last for several months after psychotherapy ends but then fade quickly, conclude psychologist John R. Weisz of Judge Baker Children's Center in Boston and his coworkers in the January *Psychological Bulletin*.

Antonuccio is concerned that harried physicians write prescriptions for SSRIs without talking in depth to emotionally troubled young patients.

Inaccurate diagnosis of depression complicates treatment, Hoffman adds. Clinicians need to ensure that depressed children don't actually suffer from bipolar disorder with its alternating periods of depression and mania, a phase characterized by euphoria and impulsive behavior.

Antidepressants can make such youngsters agitated, volatile, and possibly suicidal. At the same time, the number of diagnoses of childhood bipolar disorder has gone up so rapidly in the past few years that Hoffman suspects that some kids are being inappropriately tagged with this condition.



ISTOCKPHOTO

Even in children who clearly exhibit major depression, clinicians need to rein in any expectations that SSRIs automatically transform lives in a consistent way, Hoffman adds. "Antidepressants don't work like magic," he remarks. ■

OUT OF THE SHADOWS

Not all early mammals were shy and retiring

BY SID PERKINS

Only a few years ago, it was easy to pity the mammals that lived during the Age of Dinosaurs. Most paleontologists presumed that those tiny, shrewlike creatures, ecologically marginalized by their reptilian oppressors, thrived only by remaining out of sight. Perhaps relegated a nocturnal lifestyle, these creatures scurried about furtively and ate insects, worms, and other invertebrates.

But a recent flurry of fossil finds is giving lie to that image. New and more nearly complete specimens of mammalian species and their close kin reveal that they had expanded into ecological niches beyond the forest floor. While some turned to burrowing and others became predators, one close relative of mammals took to the water beaver-style.

TOOTHY TALES Until recently, most known fossils of early mammals consisted only of teeth or fragments of teeth. Indeed, paleontologists sometimes joke that many early mammals were nothing but teeth, which mated with other teeth to produce yet more teeth.

"For 200 years or more, ancient mammals have been categorized by their teeth," says Richard L. Cifelli, a paleontologist at the University of Oklahoma in Norman.

Teeth are the hardest materials in the mammalian body, so they are most readily preserved as fossils. Although they're distinctive, the information that can be gleaned from teeth is limited, Cifelli notes. Their shape and features provide some clues about an animal's diet, and their sizes afford a rough idea of how big the creature was.

Now, newly discovered fossils are triggering a reevaluation of how mammals eked out an existence in the shadows of the dinosaurs, which died out about 65 million years ago.

Last year, for instance, researchers analyzed the lower jaw, skull fragments, and 40 percent of the skeleton of a chipmunk-size creature that lived 150 million years ago (*SN: 4/30/05, p. 285*). The size, shape, and arrangement of its foot and limb bones suggest that the creature spent a lot of time digging. Previously, no mammals of that era had been known to have such a lifestyle.

Earlier last year, paleontologists described two nearly complete fossils of *Repenomamus*, presumably predatory mammals that lived in China about 130 million years ago (*SN: 1/15/05, p. 36*). The larger species of the genus, a 1-meter-long, badgerlike animal that weighed up to 14 kilograms, is the largest mammal yet discovered from the 170-million-year-long Age of Dinosaurs. The preserved stomach contents of its smaller cousin, an opossum-size creature, included remains of a hatchling dinosaur. "These are spectacular discoveries," says Jason A. Lillegraven, a paleontologist at the University of Wyoming in Laramie. "They show a degree of diversification [of early mammals] that we hadn't recognized before."

THE WATER'S FINE — Webbed feet and a beaverlike tail hint that *Castorocauda*, a close relative of mammals, led a semiaquatic lifestyle.

M. KLINGLER/CARNEGIE MUSEUM OF NATURAL HISTORY

IN THE SWIM The latest entry in the early mammalian diversity parade is *Castorocauda lutrasimilis*—which, translated from Latin, means "beaver-tailed creature that looks like an otter." The 50-centimeter-long creature, about the size of a modern-day platypus, lived about 164 million years ago in what is now northeastern China. It belongs to a group of animals called mammaliaforms, a dead-end lineage that branched off near the base of the mammal family tree, says Zhe-Xi Luo, a paleontologist at the Carnegie Museum of Natural History in Pittsburgh.

The well-preserved remains of *Castorocauda* show that its body was covered with a thick underfur and an outer coat of longer, stiffer guard hairs—the earliest fossilized fur found to date. The discovery hints that the closest common ancestor of this creature and all living mammals also sported fur, Luo notes.

Castorocauda probably tipped the scale at around 800 grams, at least 10 times the weight of its known mammalian contemporaries. The outermost three-quarters of the creature's tail, like that of today's beaver, was covered with leathery scales and some guard hairs. Many of the tail vertebrae are shaped like those of beavers and otters, which use their tails to move through water.

Castorocauda's rearmost molars served double duty, shearing food apart with their triangular peaks and then grinding it. In front of those molars were thin, blade-like teeth with five ragged cusps, some slightly curved toward the back of the mouth. Modern-day seals have both these types of teeth, so *Castorocauda* probably dined on fish and aquatic invertebrates.

Impressions of soft tissue around *Castorocauda*'s rear feet suggest that those feet were webbed. Some features of the forelimbs would have made the creature well suited for digging, so *Castorocauda* probably lived in burrows along riverbanks and lake shores. Luo and his colleagues describe the creature in the Feb. 24 *Science*.

"This exciting fossil is a further jigsaw puzzle piece ... demonstrating that the diversity and early evolutionary history of mammals were much more complex than perceived less than a decade ago," says Thomas Martin, a paleontologist at the Senckenberg Research Institute in Frankfurt, Germany. ■

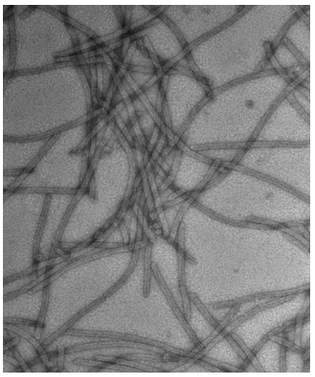
OF NOTE

NANOTECHNOLOGY

Viral building blocks

Proteins taken from a spherical virus and combined with pieces of DNA can form tubular nanostructures, researchers report. The finding could offer clues to how such molecules self-assemble.

In nature, the well-studied cowpea chlorotic mottle virus turns the leaves of the cowpea plant yellow, but it doesn't harm its host. The virus has a 20-sided, spherical outer shell composed of RNA and viral proteins. It owes this geometry to the way that these two components weakly bind, says Adam Zlotnick of the University of Oklahoma Health Science Center in Oklahoma City.



TUBE TIME Proteins from the spherical cowpea chlorotic mottle virus and pieces of DNA mingle to form tubular structures.

Zlotnick and his group combined the proteins with 500 base-pair-long pieces of double-stranded DNA in test tubes. Looking at the sample under transmission-electron microscopy, "we were delighted to see these beautiful tubes," Zlotnick says.

The tubes are 17 nanometers in diameter and can be up to 5 micrometers long, depending on the ratio of DNA to viral protein. The negatively charged pieces of DNA—staggered in parallel along the length of the tube—act as an inner scaffold, attracting the positively charged proteins that form a tube's wall.

The researchers describe the tubes in the March 1 *Journal of the American Chemical Society*. —A.C.

GENETICS

Small difference factored big in rice domestication

A change in a single position of a rice plant's genetic code lets it hold onto grains until harvest, new research suggests. The finding may give scientists new insights into how people domesticated rice, a food eaten daily by about half the world's population.

Unlike its wild-grass relatives that scatter seeds readily once they ripen, rice plants keep a firm grip on their seeds after they mature. This process enables rice farmers to collect grains easily to replant or process into food.

Scientists have long known that the capacity to retain grains played a pivotal role in rice domestication, says Tao Sang, a plant geneticist at Michigan State University in East Lansing. However, the genes controlling this phenomenon remained a mystery.

To investigate, Sang and his colleagues compared segments of rice's DNA with those of several of its wild relatives. The researchers homed in on a single gene on the plants' chromosome 4. In this gene, the researchers noticed a small difference in the sequence of DNA subunits, which go by the letters A, C, T, and G. In one location where the wild relatives have a G, domestic rice has a T.

After the researchers genetically engineered the rice to have a G in that location, their plants released their seeds easily, as their wild relatives do. The researchers report these results in an upcoming *Science*. —C.B.

GENETICS

Evolution persisted in agricultural era

Natural selection continued to sculpt humanity's genetic identity after the Stone Age gave way to farming around 11,000 years ago, according to a new DNA analysis.

A team led by Jonathan K. Pritchard of the University of Chicago identified survival-enhancing gene variants that began spreading through human populations between roughly 10,800 and 6,600 years ago.

The scientists scanned the genomes of 89 East Asians, 60 Europeans, and 60 Africans to find DNA stretches recently affected by natural selection. Their technique exploits the tendency of DNA regions containing advantageous genes to spread quickly through populations and generate relatively few mutations.

More than 700 gene variants showed both those characteristics, Pritchard's group reports in the March *PloS Biology*. Scientists know the function of some of the genes whose variants were identified.

Some of the genes influence fertility and reproduction, such as one that affects the protein structure of sperm in East Asians and Africans. Four other highlighted genes contribute to skin pigmentation in Europeans; mutations in those genes have been linked to disorders that cause unusually light pigmentation or albinism.

Recent natural selection also affected various genes involved in skeletal development in each population, the team reports.

Additional genes spread through populations after the advent of agriculture as people adapted to new kinds of food and colonized new areas, the researchers say. These include genes that contribute to the processing of lactose in Europeans, alcohol in East Asians, and dietary fatty acids in all three populations studied.

Several genes that affect the brain also responded to natural selection during agricultural times, the investigators say. However, they found no such evidence for two brain genes previously touted as subjects of recent natural selection (*SN: 9/24/05, p. 206*). —B.B.

ENVIRONMENT

Manufacturers agree to phase out nonstick chemical

Complying with a request from the Environmental Protection Agency, the companies that make perfluorooctanoic acid (PFOA) have agreed to work toward ending production of the chemical worldwide by 2015. The agency requested the voluntary phaseout in late January, days before the majority of the scientists on one of its advisory boards deemed PFOA a "likely carcinogen."

All eight manufacturers have also agreed to cut PFOA emissions and use in commercial products by 95 percent within 5 years, the EPA announced on March 2.

PFOA is used to make the nonstick coatings on microwave popcorn bags, cookware, fabrics, and other goods. The chemical, which contaminates water, air, and wildlife, is ubiquitous in people's blood (*SN: 11/26/05, p. 341*), but scientists aren't sure how it gets into the bloodstream.

DuPont of Wilmington, Del., the sole U.S.-based manufacturer and the first to sign on to the phaseout program, agreed last December to pay a fine of $16.5 million to settle charges (*SN: 7/31/04, p. 78*) that it withheld data on releases of PFOA and their effects on people. —B.H.

S. MUKHERJEE AND ZLOTNICK

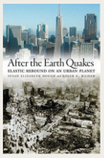
Books

A selection of new and notable books of scientific interest

AFTER THE EARTH QUAKES: Elastic Rebound on an Urban Planet

SUSAN ELIZABETH HOUGH AND ROGER G. BILHAM

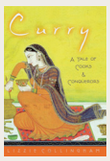
On Dec. 26, 2004, a magnitude 9 earthquake struck the ocean floor off the coast of Indonesia. The resulting tsunami claimed nearly 300,000 lives, making it one of the deadliest disasters in modern history. The next major earthquake could be far worse, write seismologist Hough and geologist Bilham. Their book traces the history of modern earthquake preparedness and response, from the aftermath of a quake that shook Lisbon, Portugal, in 1755 to the slow, ongoing cleanup of the Indian Ocean quake and tsunami. The authors borrow a geologic term, *elastic rebound*, as their theme for how people and societies bounce back after major quakes. Scientifically, the words refer to the buildup and release of destructive energy along faults. But Hough and Bilham apply the terminology to people's tendency to rebuild on top of the rubble. For example, great civilizations have replaced their cities on fault lines. The book argues for greater efforts to plan for and mitigate quake damage throughout the world. ***Oxford Univ. Press, 2005, 336 p., b&w photos and illus., hardcover, $39.95.***



CURRY: A Tale of Cooks and Conquerors

LIZZIE COLLINGHAM

The menu of curries, masalas, and vindaloos from the average Indian restaurant reflects the full flavor and rich variety of the subcontinent's cuisine. Culinary expert and historian Collingham traces the history of curry and other Indian dishes now familiar to the Western palate. The basic tenets of Indian food lie in Ayurvedic medicine, which states that the consumption of certain foods enhances the body's equilibrium. With this idea at its core, Indian food fuses influences from India's various visitors and conquerors. Fifteenth-century Portuguese explorers introduced chilies, and Mughal rulers from the Muslim north fused their love for meat with Hindu vegetarianism. Collingham traces how the British influenced India by introducing it to tea, which is now a mainstay in the Indian diet, and how Indian food and spices spread to the West and beyond. Woven throughout the book are inviting recipes for many Indian dishes. ***Oxford Univ. Press, 2005, 315 p., b&w plates, hardcover, $28.00.***



SONGBIRD JOURNEYS: Four Seasons in the Lives of Migratory Birds

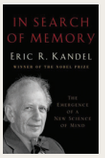
MIYOKO CHU

Each season, migratory songbirds travel thousands of miles to mate, forage, and raise their young in a carefully orchestrated exercise that has captured the imaginations of bird-watchers and scientists for centuries. Indeed, Aristotle noted that some birds migrate from nearby while others travel from the ends of the world. It is only recently that researchers have explained the full scope of this yearly ritual, employing the latest technology to study transcontinental migratory patterns. Chu, an ornithologist at the Cornell Lab of Ornithology, explains how some birds instinctively return year after year to the same areas to mate. She describes how ornithologists use NASA satellite technology to track certain species' migrations. For each season, she includes advice for observing bird migrations and a list of further readings and bird-watching activities. An epilogue examines the decline in bird migration as human activity, acid rain, and global warming imperil the birds' journeys and habitats. ***Walker & Co., 2006, 312 p., color plates, hardcover, $23.00.***

IN SEARCH OF MEMORY: The Emergence of A New Science of Mind

ERIC R. KANDEL

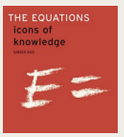
In 1952, Kandel entered medical school with the intent of becoming a psychoanalyst, but his interests shifted to the biology of the brain—and with good effect: Fifty years later, he was awarded with the Nobel Prize in Physiology or Medicine. In this memoir, Kandel traces his personal development and work as a neuroscientist as well as the history of brain research. Although his research began as a search for Freud's id, ego, and superego, it became an analysis of how the interactions among neurons result in the functioning of the human mind. He soon focused on how memories are formed in the brain. Through his landmark research, Kandel teased out the differences between implicit and explicit memory, teamed with biotechnology-industry researchers to study serotonin receptors, and investigated the biological basis of memory loss associated with conditions such as Alzheimer's. He also gives readers a revealing glimpse into his childhood as a Jew in Nazi-led Vienna, his marriage and fatherhood, and his collaboration with a number of the greatest minds in neurobiology. ***W.W. Norton, 2006, 352 p., b&w plates, hardcover, $29.95.***



THE EQUATIONS: Icons of Knowledge

SANDER BAIS

Physicists use mathematics as a language to express the laws of the universe. Equations are simple, concise summaries of these laws. In this elegant book, Bais, a theoretical physicist, explores the beauty and simplicity of some of the most famous and fundamental equations in science. From equations as familiar to physics students as *F* (force) = *m* (mass) x *a* (acceleration) to the more complex equations of quantum mechanics, he outlines what these strings of variables and constants reveal about the physical world. The book begins with a short introduction to key mathematical concepts and vocabulary. Each brief chapter then focuses on a physical principle and its corresponding equations. Historical notes provide further information on the scientists behind the math. This book will appeal to aficionados of physics and mathematics seeking clear explanations of these important expressions. ***Harvard Univ. Press, 2005, 96 p., hardcover, $18.95.***



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LETTERS

Comfort zones

Just because living organisms were found in extreme conditions does not necessarily mean they were created in these localities ("Is Anybody out There?" *SN: 1/21/06, p. 42*). Another possibility is that the creation of life took place under more amenable conditions and that these organisms, through evolution, gradually adapted as the conditions changed. We shouldn't assume that just because bacteria were found on Earth surviving under very hostile conditions that they are being created under the same or worse conditions on other planets or moons of our solar system.

THEODORE BLINDER, HAVERTOWN, PA.

Sand bagging

"In Pixels and in Health" (*SN: 1/21/06, p. 40*) illustrates one of the fascinating ways in which cellular automata have evolved into a truly useful analytical tool. However, would it not be more linguistically consistent, not to mention more accurate, to refer to the methodology as "in virtuo" rather than "in silico"? In another 50 years, the use of silicon as a computing medium may well be an historical curiosity. And to split hairs, isn't "in silico" really "in vitro"? After all, they're made of the same thing.

MICHAEL L. WRIGHT, TALLAHASSEE, FLA.

Red alert for scientists

"Red Alert for Red Apes: DNA shows big losses for Borneo orangutans" (*SN: 1/28/06, p. 51*) details logging and poaching practices that have decimated the orangutan population on Borneo. These practices are not only sad, they're criminal. It's time for scientists to become as politically active as the religious right and start fighting for actions known to be needed. In this case, it's protecting orangutans from extinction. Scientists must begin to do much more than just collect, present, and interpret data.

BRUCE BARNBAUM, GRANITE FALLS, WASH.

Correction *The name of John McDonald, director of the International Center for Spinal Cord Injury at the Kennedy Krieger Institute in Baltimore, was misspelled in "Buff and Brainy"* (SN: 2/25/06, p. 122).

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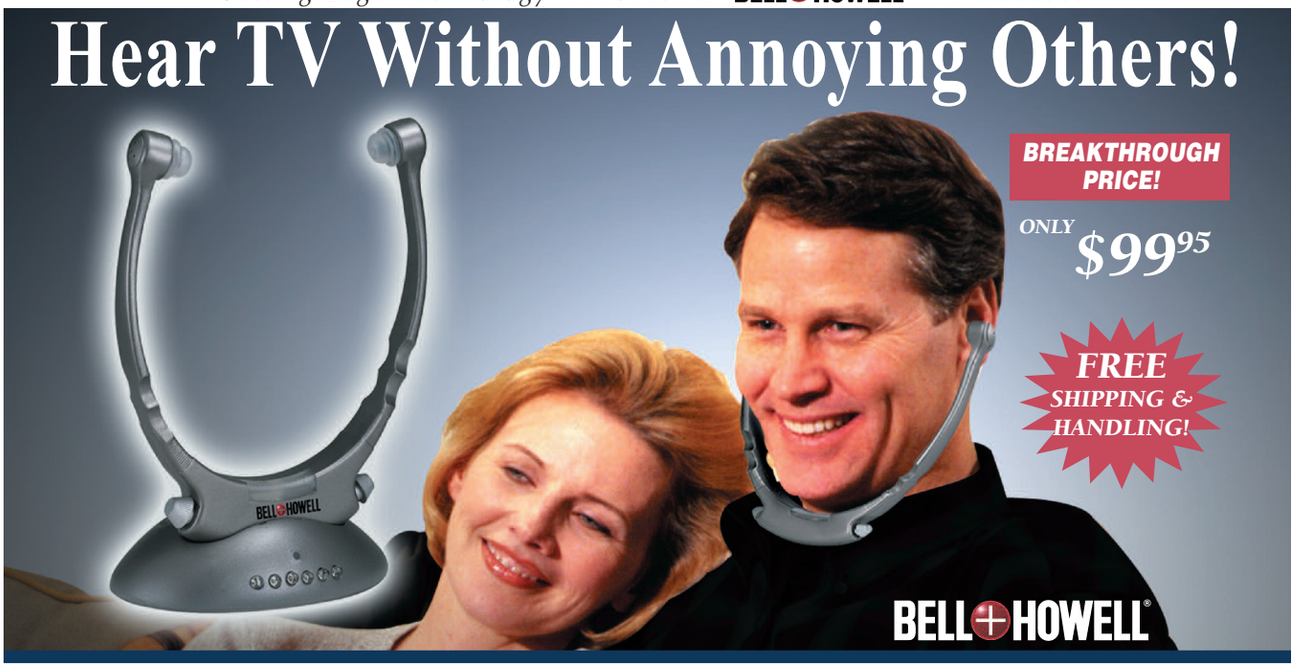

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