SCIENCE NEWS
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SEPTEMBER 22, 2007 PAGES 177-192 VOL. 172, NO. 12

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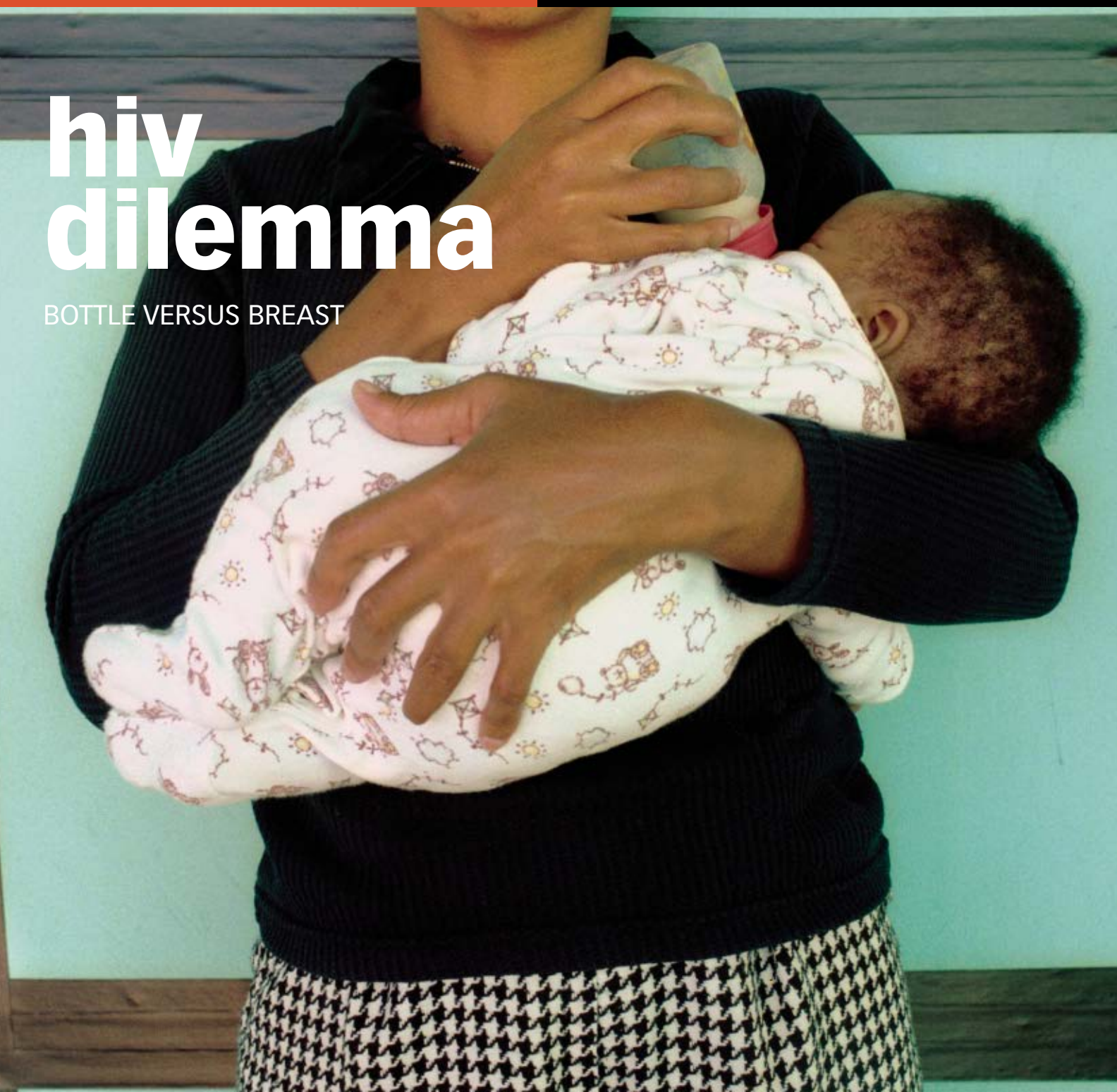

hiv dilemma

BOTTLE VERSUS BREAST

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Features

This Week

Of Note

Departments

Cover An HIV-infected mother living in the Khayelitsha squatter camp near Cape Town, South Africa, poses to promote formula feeding as a way to keep babies virusfree. However, the World Health Organization now says that where clean water and adequate health care are scarce, breast-feeding is safer. (© Gideon Mendel/Corbis) Page 187

THIS WEEK ONLINE
http://blog.sciencenews.org/

MathTrek The geographic distribution of ethnic or religious groups has a large influence on whether open conflict erupts.

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Walking Small

Humanlike legs took *Homo* out of Africa

The earliest known human ancestors that trekked from Africa into Asia possessed legs, feet, and spines much like ours, even as they sported relatively apelike arms and small brains, according to an analysis of 1.77-million-year-old fossils unearthed in the central Asian nation of Georgia.

A team led by David Lordkipanidze of the Georgian National Museum in Tbilisi recovered 33 lower-body bones from at least three adults and one teenager at a site called Dmanisi. The researchers had previously found four skulls and four lower jaws, as well as simple stone tools, in the same sediment (*SN: 5/13/00, p. 308*). In several cases, skull and lower-body remains come from the same individual.

The researchers classify these ancient finds as early *Homo*. The fossils might be from an early form of *Homo erectus* that left eastern Africa for the Asian hinterlands, but a definitive species identity remains unclear, Lordkipanidze cautions. A description of the new finds appears in the Sept. 20 *Nature*.

"The Dmanisi individuals weren't the first hominids [fossil ancestors of humans] to leave Africa," Lordkipanidze says. "They must have had more-primitive ancestors that passed through the Near East before reaching Georgia."

An intriguing mosaic of anatomical traits characterizes the Dmanisi folk. Their legs and spines closely resemble those of modern humans. In particular, Dmanisi leg and foot bones would have efficiently supported long-distance walking and running, the scientists assert.

However, the arms of Dmanisi hominids appear more like those of australopithecines, an earlier line of hominids. For instance, unlike people, the new specimens have upper arms that are straight rather than slightly curved, their shoulders are relatively narrow, and their palms are oriented forward rather than inward.

Moreover, the Dmanisi individuals are small compared with the oldest known African *H. erectus*. That specimen, a 1.5-million-year-old skeleton of a well-developed, roughly 10-year-old boy, stood tall at between 151 and 169 centimeters and weighed as much as 70 kilograms. At Dmanisi, adults reached estimated heights of between 145 and 166 cm and weighed between 40 and 50 kg.

Such estimates coincide with Dmanisi brain volumes that were one-half to two-thirds the size of modern human brains.

The Dmanisi fossils and early African *H. erectus* remains probably represent separate populations of a species that evolved variations of a common body plan as members settled different habitats, suggests anthropologist Daniel E. Lieberman of Harvard University in a comment published with the new report.

If the Dmanisi remains indeed belong to early *H. erectus*, members of that species must have returned to Africa and evolved into a larger, more modern-looking form by 1.5 million years ago, remarks anthropologist William L. Jungers of Stony Brook (N.Y.) University Medical Center. In his view, the Dmanisi foot bones were built for long-distance walking but show no convincing sign of having supported a fully modern running ability.

GEORGIAN NATIONAL MUSEUM

LEG UP **Researchers uncovered this leg bone and other fossils from a *Homo* species that inhabited central Asia's Dmanisi site 1.77 million years ago.**

Jungers adds that the australopithecine-like arm traits in Dmanisi individuals also appear in *Homo floresiensis*, Indonesian ancestors that some researchers regard as modern humans with a developmental disorder (*SN: 11/18/06, p. 330*). Jungers, however, contends that *H. floresiensis* was a separate species that preserved some primitive skeletal features, just as *H. erectus* did at Dmanisi. —B. BOWER

Aiding and Abetting

A longevity gene also promotes cancer

A gene that helps organisms survive damage to their cells can also shorten their lives by fostering tumors, tests on mice and human-cell lines show.

The gene, called heat-shock factor 1 (*Hsf1*), doesn't itself trigger cancer. Instead, it appears to help cells survive the stressful process of becoming cancerous, which involves extensive damage to DNA and the malfunctioning of many proteins.

The discovery reveals a dark side of *Hsf1*, which is known to promote longevity in lab-grown roundworms and to protect people against the brain-cell damage of Alzheimer's and Parkinson's diseases. Some researchers are developing drugs that might ease the brain diseases by boosting *Hsf1* activity.

Now it appears that hindering *Hsf1* could be a new way to combat cancer.

The new study "does bring [*Hsf1*] forward as a possible therapeutic target" in cancer research, says team member Luke Whitesell of the Whitehead Institute for Biomedical Research in Cambridge, Mass. However, Whitesell cautions that more work is needed before scientists can develop cancer drugs that exploit this discovery.

The cancer-facilitating effects of *Hsf1* may stem from its role as the ringleader of so-called heat-shock proteins. Stresses such as excessive heat, exposure to free radicals, or a lack of oxygen can damage a cell's molecular machinery. When that happens, heat-shock proteins can keep a cell healthy by either fixing or expelling damaged cellular components.

Hsf1 activates this repair system by boosting the activity of heat-shock proteins. The gene also regulates proteins involved in energy production and cell proliferation, which might also contribute to the gene's ability to aid cancer formation.

Scientists had previously observed that tumor cells often have abnormally high quantities of heat-shock proteins. Whitesell and his colleagues wondered whether those proteins had a role in keeping the tumor cells alive.

The researchers tested their idea by inducing skin cancer in 29 normal mice and 23 mice engineered to lack *Hsf1*. The mice without *Hsf1* had a significantly lower incidence of cancer than did the genetically normal group, the team reported in the Sept. 21 *Cell*. After 55 weeks, more than 90 percent of the

Hsf1-free mice were still alive, while only about 35 percent of the normal mice had survived.

When Whitesell's team repeated the experiment on mice with a cancer-causing genetic mutation, about 75 percent of the mice without *Hsf1* survived at least 90 weeks, while none of the mice with intact *Hsf1* genes did.

Some cancers appear to have a similar dependence on the gene. The researchers blocked *Hsf1* activity in a variety of human-cancer cells growing in the lab. In all cases, most of the cancer cells died. Healthy human cells growing in similar conditions showed no ill effects from blocking the gene's activity, reinforcing the point that *Hsf1* is critical only for cells under duress.

"I thought the results were very clear," comments Stephen J. Elledge of Harvard Medical School in Boston, who wrote a commentary on the work for *Cell*. "This [gene] has a major role in affecting tumor formation." —P. BARRY

QUOTE

"This [gene] has a major role in affecting tumor formation."
STEPHEN J. ELLEDGE, Harvard Medical School

Hybrid Power

Salamander invader ups survival of rare cousin

Crossbreeding between the rare California tiger salamander and an invasive species has given the mixed offspring a surprising boost in survival, say geneticists.

Though the lineages of barred tiger salamanders and the California tigers split some 5 million years ago, the species crossbreed in the Salinas Valley, according to Benjamin M. Fitzpatrick of the University of Tennessee in Knoxville. Fish-bait entrepreneurs imported young barred salamanders from Texas about 60 years ago.

Mixing species often doesn't work out well for the kids. But in this case, the mixed-parentage hatchlings survive their perilous first few weeks better than the young of either parent species do, report Fitzpatrick and Bradley Shaffer of the University of California, Davis. The finding raises tricky questions for conservationists, who normally try to protect rare species against hybridizing.

Some 17 species of tiger salamanders live in North America, and California's *Ambystoma californiense* thrives in pools that dry out as summer progresses. Much of the salamander's habitat has disappeared under asphalt or crops. The Endangered Species Act protects them. Two small populations are listed as endangered, while most of the state's population, including those in the Salinas Valley, ranks as threatened.

The barred tiger salamanders (*Ambystoma tigrinum mavortium*) have more-elongated yellow markings. Since bait sellers brought them in, they have hybridized with natives in up to 20 percent of the California species' current range.

Lots of species crossbreed to some extent, and results vary. Two lineages sometimes produce superoffspring that outperform their parents, a phenomenon called hybrid vigor. But, more often, the young lack the ability to respond to their environment that had been finely tuned in their parents, or they fail to reproduce as well.

Starting the project, "I was actually interested in studying hybrid dysfunction," says Fitzpatrick. He and Shaffer looked to an ongoing salamander-genome project and selected nine DNA sites to check for signs of hybridization. Analyzing these sites in specimens from five locations in the Salinas Valley, Fitzpatrick and Shaffer categorized the degree of hybridization in salamanders that were newly hatched or several weeks older. The more mixed the genes from the two species were, the more likely the youngsters were to have survived.

The results "clearly support hybrid vigor," says Fitzpatrick. Results appear online and in an upcoming *Proceedings of the National Academy of Sciences*.

The analysis doesn't test for effects of mixed parentage later in life, however, cautions Sam Sweet of the University of California, Santa Barbara. Also, "we may not yet have seen rare events where the exotic genotype may be less advantageous."

"It is of course always preferable to retain pure genetic stocks," says Sweet. In the Salinas Valley, however, hybridizing has gone on too long for invader eradication to be "a workable solution" for preserving California tiger salamanders, he adds.

The hybrids now have the same protection as the purebloods that they so closely resemble, says Al Donner of the U.S. Fish and Wildlife Service in Sacramento, Calif. "Our approach is that you protect them because of the similarities." —S. MILIUS

Nanotherapy

Gold-drug combo could target tumors

Looking for a way to deliver a chemother-apy drug to cancer patients more safely and effectively, a team of chemists has attached dozens of paclitaxel (Taxol) molecules to tiny gold particles that could carry the drug directly to a tumor in the body.

Paclitaxel, first isolated from the bark of the Pacific yew tree in 1967, is widely prescribed for people with lung, ovarian, or breast cancers. Because the drug isn't water soluble, it's mixed into a solvent called cremophor, which can cause severe allergic reactions and is responsible for many of the treatment's side effects.

To create an alternative delivery system, chemist Eugene Zubarev and his graduate students at Rice University in Houston turned to particles of gold just 2 nanometers wide. Once injected into the bloodstream, the drug-loaded spheres should automatically accumulate in the tumor, says Zubarev.

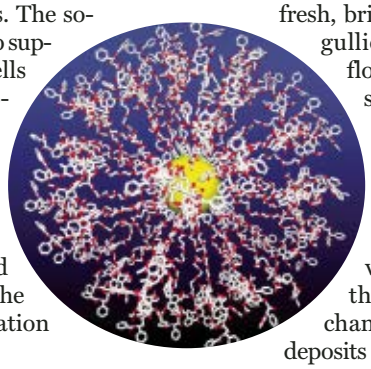
That's because cancerous tumors are surrounded by leaky blood vessels with large pores. "When you inject a particle that is smaller than the average size of those holes, the particles will primarily end up inside that tumor," says Zubarev. Furthermore, the nanoparticles are small enough to avoid detection by the immune system.

The trick was to figure out how to attach

GETTY IMAGES

BARRED INVADER The barred tiger salamander, brought to California from Texas decades ago, mates readily with an imperiled native-California species.

paclitaxel to gold without affecting the drug's activity. The drug molecule has three sites that can serve as anchors. The so-called 2-prime site binds to support structures inside cells called microtubules, stopping the cells from dividing. Scientists have used the 2-prime site to attach paclitaxel to a variety of drug carriers, but then a second chemical is needed to cleave the drug from the carrier once the combination has entered a tumor cell.



GOLDEN COMBO **When injected into the bloodstream, a gold nanoparticle (center) coated with dozens of paclitaxel molecules could deliver the chemotherapy drug straight to a tumor.**

The Rice team used a different site on the drug. As they report in the Sept. 19 *Journal of the American Chemical Society*, the researchers first protected the 2-prime site by blocking it with a chemical attachment. Through a series of chemical steps, they then anchored the paclitaxel to the gold particles. Finally, they removed the protective chemical from the 2-prime site.

Using several techniques, the researchers determined that each particle carried about 70 molecules of paclitaxel. Knowing that number is critical for controlling dosage, says Zubarev. With other drug-delivery systems, it's often difficult to quantify how much drug is present.

Vincent Rotello, a chemist at the University of Massachusetts, Amherst, praises the team for the level of control that it achieved in coating the particles with paclitaxel. "If you have a system that's much more organized, it's easier to control the rate of release," he says.

Zubarev and his students have further modified their gold particles with a polymer to make them water soluble, and they're currently testing the drug-loaded particles in cells. —A. GOHO

Muddying the Water?

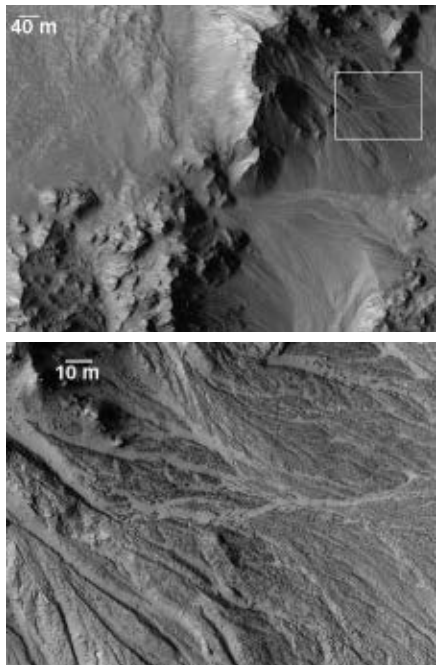
Orbiter drains confidence from fluid story of Mars

Evidence for liquid water on some parts of Mars—now or in the past—looks leakier than researchers had supposed, according to an analysis of the sharpest images ever taken of the Red Planet from orbit. But in other places, the new images bolster the case that water once flowed.

High-resolution pictures and infrared spectra recorded by NASA's Mars Reconnaissance Orbiter (MRO) indicate that fresh, bright streaks on two steep gullies don't signify a recent flow of water, as scientists suggested just a year ago (*SN: 12/23/06, p. 416*). MRO's instruments neither detected minerals that might have been left behind as salty groundwater evaporated from those regions nor found changes in the shapes of the deposits since the gullies were last imaged 15 months ago. Such changes could have occurred if the bright deposits were frost created by an underground supply of water rushing to the frigid surface in recent years or months.

Instead, the deposits on the steep gullies could just as easily have been formed by landslides of dry, sandy material, assert Alfred McEwen of the University of Arizona in Tucson and his colleagues in one of five reports of MRO findings in the Sept. 21 *Science*. Other gullies, however, whose slopes are too shallow to permit landslides, do offer clear evidence of watery flows. These flows might have occurred several million years ago, when the Martian climate was warmer.

McEwen, Windy Jaeger of the U.S. Geological Survey in Flagstaff, Ariz., and their collaborators reexamined a 300-kilometer-long system of channels called Athabasca Valles, which in lower-resolution images taken by previous spacecraft showed some resemblance to a frozen sea. Although not ruling out water might have carved the system, the new images suggest that the structure is more likely a remnant of a "once-swollen river of lava," the researchers say in another of the five reports.



WATERING HOLE? **Photo of Mars' 60-kilometer-wide Mojave crater (top) shows pale, fan-shaped streaks and channels (detailed at bottom). The features suggest that water flowed in the region after an impactor struck an icy crust.**

ZUBAREV/RICE UNIV.; NASA

Theorists have invoked the presence of liquid water for "nearly every imaginable time and place on Mars," notes McEwen. But the interpretation of planetary features "can completely change with better observations," he adds.

Although the MRO images cover only 0.2 percent of the Martian surface, they reveal features as small as 50 centimeters across, about 10 times the resolution of previous satellite images. MRO reached Mars last year and is now recording a terabyte of data a week—more than many missions do during their entire lives.

Elsewhere on the Red Planet, McEwen notes, water might have played a more important role than had been indicated. The MRO camera reveals branched channels and fanlike deposits adjacent to several large craters. The channels and deposits suggest the flow of water, perhaps when meteoroids slammed into an ice-rich crust, McEwen suggests.

As well as excavating craters, the impacts would have created transient, wet microenvironments in which liquid water sculpted the channels and left behind the deposits, he says. Images of the features support the hypothesis that ancient Mars had sporadic episodes of warm, wet weather at specific sites but not a warm, planetwide climate for long periods.

Some scientists in the past may have been too quick to jump on the bandwagon for a wet Mars, comments Philip Christensen of Arizona State University in Tempe. The new findings add to the evidence that the planet had liquid water "only for brief periods" during an otherwise cold and dry history, he says. —R. COWEN

Bumpy Bones

Fossil hints that dinosaur had feathery forearms

Several knobs on a forearm bone from a 1.5-meter-long predatory dinosaur provide the first direct evidence of substantial feathers on a dinosaur that large.

Scientists first described fossils of *Velociraptor mongoliensis* in 1924, but the creature gained pop-culture notoriety in the 1993 film *Jurassic Park*. Researchers have unearthed remains of only about 20 velociraptors, and most discoveries have taken place in the past 15 years or so, says Alan H. Turner, a paleontologist at the American Museum of Natural History in New York City.

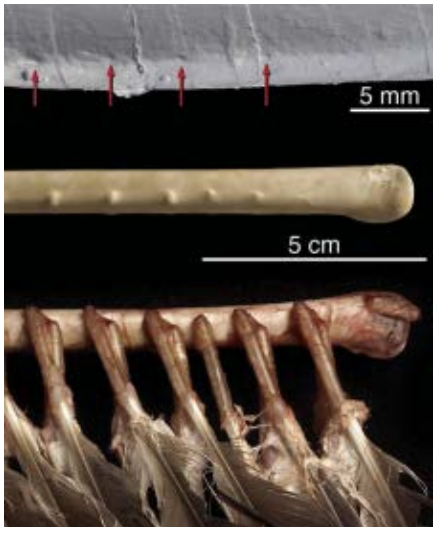
Now, Turner and his colleagues have scru-

tinized the 80-million-year-old fossils of a velociraptor unearthed in the Gobi Desert in 1998. Sixty percent of the specimen's bones have been recovered, and the scientists found a feature not seen on other velociraptors: a series of six regularly spaced bumps on the ulna, one of the bones in its forearm. Each protuberance is about 0.8 millimeter across and is spaced about 4 mm from its neighbor.

On modern birds, such bumps, called quill knobs, are where ligaments connect the major flight feathers of the wing to the bone. Not all birds have quill knobs, and the number of such bumps can vary even among birds of the same species, says Turner. However, the presence of quill knobs on a bone is a sure sign that feathers were attached there, he adds.

The bumps on the velociraptor fossil have a rough texture, as the quill knobs of modern birds do, which further indicates that ligaments were attached there, says Turner. Although he and his colleagues found only six such protuberances, their spacing on the bone suggests that up to 14 large feathers—some not attached to quill knobs—could have adorned each forelimb. The researchers report their findings in the Sept. 21 *Science*.

Some fossils of several small dinosaurs that are closely related to velociraptors, such as those of the genus *Microraptor*, have included feathers (*SN: 1/25/03, p. 51*). Members of those species typically measure no more than 1 m long, and they presumably glided from tree to tree (*SN: 1/27/07, p. 53*). Velociraptors, however, were not only larger than microraptors but also too hefty to get airborne. The 1.5-m-long specimen that Turner and his colleagues analyzed probably stood about 1 m tall at the hip and weighed around 15 kilograms.



FOSSIL PHRENOLOGY Regularly spaced bumps on the 80-million-year-old fossil of a velociraptor (arrows, top), like those on the comparable bone of a modern turkey vulture (middle and bottom), probably supported substantial feathers.

Nor would just a few large wing feathers have helped velociraptors regulate their body temperatures, says Turner. But the animals could have used such feathers to shield a nest from sunlight or from the ever-prying eyes of predators. The feathers might also have increased maneuverability, enabling the animals to make faster turns or higher leaps, Turner notes.

The presence of quill knobs suggests that the feathers had some sort of aerodynamic, load-bearing function, says Thomas R. Holtz Jr., a vertebrate paleontologist at the University of Maryland at College Park. "This goes to show that even a well-known dinosaur like *Velociraptor* [*mongoliensis*] can still provide surprises," he adds. —S. PERKINS

Nanotube Press

Printing technique makes nanotransistors

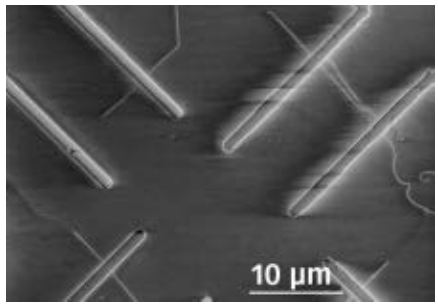
With a combination of existing methods, some new tricks, and a drop of water, researchers have found a way of stamping carbon-nanotube circuits onto virtually any surface. The technique might lead to bright, flexible displays and to more-powerful wireless-communications chips.

Carbon nanotubes are chicken wire–style networks of carbon atoms rolled up to form hollow rods that are only nanometers across. The alignment of the chicken wire hexagons relative to the axis of a nanotube determines its electronic properties. Correspondingly, when nanotubes form, some turn out to be semiconductors, while others emerge as better conductors than any metal.

Nanotubes are also extremely strong and can withstand temperatures of many hundreds of degrees. These properties make them ideal as molecular-scale components of electronic circuits that could be faster than ordinary, silicon-based chips. But so far, nanotubes have been tricky to assemble into circuits in a way that might be reproduced on industrial scales.

Yael Hanein and her team at Tel Aviv University have now taken steps toward being able to mass-produce carbon-nanotube circuitry. The researchers first made arrays of silicon pillars spaced tens of microns apart. Using a standard technique, they then grew a grid of carbon nanotubes strung from one pillar to another.

The researchers used optical measurements to examine the nanotubes' structures and identify which were conductors and which were semiconductors. Next, they pressed their grid onto a glass surface. After months of trial and error, the team discovered that wetting the glass helped bind a network of nanotubes to the surface, and that the materials would stick together even after the water had evaporated.



TINY TRANSISTORS Pairs of metal contacts (thick bars) lie atop printed carbon nanotubes (thin lines), forming transistors visible only in this electron microscope image.

The novelty of the method lies in combining optical mapping with the researchers' newfound water-printing trick, Hanein says. "When the tubes are suspended, you can easily map them." Because the locations of conducting and semiconducting tubes are known and the network is accurately transferred onto a surface, it is relatively easy to create a desired circuit by adding metal connections at certain spots or by etching away excess nanotubes, Hanein says. The results appear in the September *Nano Letters*.

Hanein's team has demonstrated a simple arrangement of nanotubes that acts like a transistor and shown that it or similar devices could find applications in high-speed electronics for wireless communications.

Hanein adds that the method can print circuits on a variety of surfaces. "You could even think of flexible materials with [light-emitting diodes] on them," she says. Such sheets could then act as energy-efficient lighting fixtures or even as color displays.

Cees Dekker of Delft University of Technology in the Netherlands calls the new method "very original" and "exciting," in that it can both determine the nanotubes' conductivity and arrange them in an orderly fashion.

According to Boris Yakobson of Rice University in Houston, the results suggest that it might be possible to use a single template of pillars to produce multiple copies of a circuit, "à la Gutenberg." However, he adds, the new technique isn't yet fully reproducible, since no one has figured out how to control which kind of conductor a growing nanotube becomes. "It is kind of like printing a predefined pattern with random inks." —D. CASTELVECCHI

SCIENCE; NANO LETTERS

The Making of Man: Follow the Path of Our Evolutionary Past

Discover cutting-edge answers with a noted expert in biological anthropology

While human history is usually studied from the perspective of a few hundred years, anthropologists consider deeper causes for the ways we act. In **Roots of Human Behavior**, anthropologist Barbara J. King uses her wealth of research experience to open a window of understanding for you into the legacy left by our primate past.

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Defining "Human"

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Thus we look back to a forest in Africa, millions of years ago, when a species of great ape split into distinct lineages, then evolved and divided further to create our closest living relatives, and then human beings.

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What can chimpanzees tell us about ourselves?

Elsewhere, in Asia and the New World, other anthropoid primates followed their own evolutionary course, separate from the human lineage, yet still connected in important ways. From this vantage point, we can see the vast and vibrant range of species to which we are related, not just anatomically, but behaviorally.

About Your Professor

Professor Barbara J. King is a biological anthropologist and Professor of Anthropology at The College of William and Mary. Professor King received her B.A. in Anthropology from Douglass College, Rutgers University, and earned her M.A. and Ph.D. from the University of Oklahoma. Professor King's research interests concern the social communication of the great apes, the species closest to human.

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WARMING TO A COLD WAR HERB

Soviet secret finds its way west

BY BRIAN VASTAG

Zakir Ramazanov first encountered *Rhodiola rosea* in 1979 as a Soviet soldier in Afghanistan. A comrade often received boxes full of the yellow-flowered mountain herb from his home in Siberia and would prepare and share a sweet-smelling tea from the root. Ramazanov found that the drink seemed to quicken his hiking and speed his recovery after a taxing mission.

After Ramazanov left the army, he forgot about the Siberian herb. Despite having a good job, he felt depressed, and flashbacks from the war interfered with his daily tasks. After trying various drugs and natural remedies to ease his symptoms, he happened upon a lecture about rhodiola. He learned that the Soviets had been studying the herb since the 1940s, feeding it to Olympic athletes and cosmonauts. Government scientists had noted that rhodiola boosted the body's response to stress.

HILLSIDE HABITAT — ***Rhodiola rosea*** **(yellow flowers at left) grows in the Altai Mountains of Siberia. The plant thrives in cold climates at high altitudes.**

BROWN

If it was good enough for weight lifters and space travelers, it was good enough for him, Ramazanov thought. He began taking rhodiola extracts, and after a month his symptoms lifted. He had more energy during the day and could finally sleep at night. The horrific war images faded and his concentration improved.

After the Soviet Union collapsed, Ramazanov moved to New York State, began translating Russian rhodiola research, and started a small business to import the herb. A few years later, Richard Brown, a psychiatrist at Columbia University College of Physicians and Surgeons, heard about rhodiola from two of his patients. They independently mentioned that the herb, sold as a dietary supplement in the United States by a company affiliated with Ramazanov, had eased their depression.

Brown tracked down Ramazanov's company and wrote to him. The two began a correspondence that gave Brown enough confidence in the safety of rhodiola to try it himself. "Almost immediately, my mind seemed clearer," he says. "I was more energetic and less stressed. After a few days, I noticed I recovered from exercise more quickly."

Brown recommended the herb to his wife, Patricia Gerbarg, also a psychiatrist, who was housebound from a debilitating bout with Lyme disease. After 10 days, Gerbarg reported feeling much better. Her memory rebounded, and she had enough energy to again play chess with her son—and beat him, a rare event. "I have my life back," she declared. Since then, Brown and Gerbarg have recommended the herb to hundreds of patients, often in conjunction with standard antidepressants.

Much of the old Soviet research on the herb remains locked away in Russian language journals. But over the past decade a growing body of new research published in English tentatively supports the results of early Soviet research. Laboratory and animal studies show that the herb may inhibit cancer cells, protect healthy cells from toxins, and correct enzyme imbalances associated with diabetes. In addition, four trials with human volunteers show that rhodiola extracts can boost mental performance, reduce fatigue, and ease depression.

RUSSIAN REVOLUTION

Growing at high altitudes from Scandinavia to Siberia, rhodiola has for centuries been a part of folk medicine among diverse native groups. Documented medicinal use reaches back at least to A.D. 77, when a physician to Roman legionnaires recommended it for headaches. In the 18th century, Linnaeus gave the herb its scientific name.

Soviet-government scientists Nikolai Lazarev and Israel Brekhman knew of this traditional use when, after World War II, they launched an extensive program to boost Soviet competitiveness in athletics and other demanding fields. The scientists tested nearly 200 herbal folk remedies and found 5, including rhodiola, particularly intriguing. They called the plants adaptogens for their ability to foster increased resistance to stress and to boost physical and mental performance. Unlike amphetamines, which the postwar Soviets also tested, these plants weren't addictive, and users didn't "crash" or suffer a rebound period of profound fatigue.

The adaptogens performed well on a pivotal test invented by the Soviets, an endurance swim for rats. When plopped into water, a rat will swim steadily for 10 to 15 minutes. Then it will float, paddling only as needed to keep from drowning. When the Soviet scientists gave rats rhodiola, the animals swam 35 percent to 59 percent longer. A modified version of the test is still used by academic researchers and drug companies to screen for potential new antidepressants.

By 1969, Soviet scientists had amassed enough evidence for the

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The world map shows all 177 craters plotted geographically with the names of the craters, latitude and longitude and keyed to a data table. There are pictures and text about some of the amazing rock and mineral types that are created ONLY by hypervelocity impacts. A sectional graphic shows how craters are formed when the meteorite/ asteroid/ comet hits the ground, and the types of crater they produce. A section is devoted to Gene Shoemaker, considered to be the "father of impact science." A handy time line graph on the bottom of the poster shows the dating of 6 extinction events and their titles. The poster comes with a 4 page in-color information sheet with photos of meteorites, interesting questions and answers.

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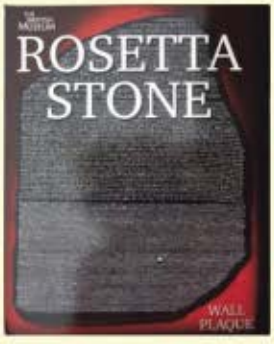

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The Rosetta Stone was discovered in 1799, by which time all knowledge of the ancient Egyptian language had been lost for over 1,000 years. The known Greek section at the bottom of the stone helped scholars decipher the two Egyptian scripts, the middle one written in cursive demotic script and the top version in ancient hieroglyphs.
This reduced-sized replica measures 12 3/8"H X 10 5/8"W X ½" D and is supplied with a fixture for wall hanging. Produced by the British Museum. Order #JPT-rosetta; Cost: $85

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The meteorite in this jewelry pendant is a NWA 869 (North West Africa). Many beautiful meteorites are coming from this part of the world. It is among the prettiest class of chondrite meteorites, and is a L-5 type chondrite. The meteorite was discovered in 1999 near Tindouf, Algeria, Africa. One side has been coated with a protectant material that helps you see the natural beauty of the meteorite better. The other side has been left uncoated so you can see what they look like naturally. Certified authentic: Jensan Scientifics, LLC Comes with information in an attractive black velvet jewelry box.

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This pendant comes with a braided Sterling Silver Chain 20" For the person that has everything. We bet they do not have this!

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This jewelry was carefully carved out of extinct mammoth ivory. It comes wire wrapped in 14K gold with a matching 20" braided 14K gold chain.

The ivory rose pendant was made from ancient fossil *Mammoth Ivory* that lay buried in the snows of Alaska for over 50,000 years. The yearly melting of the snow and minerals in the earth have given the mammoth ivory it's unique color. The ivory was unearthed by Eskimos and carved by a master carver.
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Canada's Long-Term Commitment

Market potential lures investment

Across the plains of Alberta, plots of rhodiola await harvesting. In 2004, the Canadian provincial government launched a program to commercialize the plant. Fifty growers received seedlings, and some 50 acres are now being grown.

It takes 3 to 5 years for the roots to develop sufficient concentrations of active ingredients for harvesting, making the project a long-term commitment, says Shirzad Chunara, marketing manager at Alberta Agriculture and Food in Edmonton. The province has pledged $750,000 for the project through 2010. "We chose it because … the market for it looks promising," says Chunara.

The plant is ideally adapted to Alberta's harsh winters. The province earlier tried to commercialize Echinacea, but more than half the plants succumbed to the cold. More than 90 percent of rhodiola plants survived their first three winters, a testament to the species' near-Arctic origins.

After processing the roots, University of Alberta scientists will conduct a small trial in human volunteers, says Chunara. The Canadian government's herbal medicine agency requires such tests before it will certify any products containing the herb.

Bertalam Galambosi, a Finnish-government agronomist who's spent 15 years working small test plots of rhodiola, says that projects such as Alberta's are crucial to the long-term viability of the plant. Some 20 to 30 tons of dry root are exported from Russia each year, he says, and the country recently restricted harvesting. Galambosi is trying to improve growing, harvesting, and processing techniques.

"It's very young as a domesticated plant, and there are lots of open questions, such as how to shorten this 5-year cycle and how to mechanize harvesting. But over the long term, with demand continuing to climb, cultivation will be the only source." —B.V.

Ministry of Health to recommend rhodiola in its official list of medicines. Use of the herb took off.

"The Soviets were really invested in it," says Georg Wikman of the Swedish Herbal Institute in Göteborg, who studies the herb. "There must be 300 to 400 reports published in quite good Russian-language journals."

Much of the Soviet research on the herb remains untranslated or locked away because authorities considered adaptogen research a "top military secret," Ramazanov maintained before his death last year. Nevertheless, he had translated some key findings by that time. In animals, the herb lowers production of the stress hormone cortisol. It acts as an antioxidant, helping to eliminate from the body the oxygen radicals that damage cells. And in muscles, it increases production of adenosine triphosphate, the molecule that serves as cellular gasoline.

Trials in people, while not up to Western standards, hinted that rhodiola could alleviate depression, erectile dysfunction and premature ejaculation, and chronic listlessness.

Other, higher quality trials suggested that the herb could boost athletic performance. A trial run by Victor Baranov at Moscow's Institute for Space Medicine in the 1990s found that after taking rhodiola, inactive adults performed just as well as trained athletes in aerobic tests. During that experiment, researchers randomly assigned volunteers to take either the herb or a placebo, and participants, as well as their testers, were blind to which was which. Around the same time, another such randomized, double-blind study of 42 male biathletes reported improved target shooting in the group that took the herb. Also, the extract seemed to speed recovery of the athletes' circulatory systems. Thirty minutes after the skiing part of the biathlon, the hearts of those who took the extract were beating at 105 percent of prerace rates, compared with 129 percent of precompetition rates among athletes who took a placebo.

In the late 1980s, researchers at the Russian Academy of Sciences in Moscow, home to much of the adaptogen work, discovered that three compounds found only in the *rosea* type of *Rhodiola*—there are at least 200 related species—were responsible for much of the plant's activity. They dubbed these compounds rosavins, and in 1989 the Soviet government declared that all rhodiola extracts must contain at least 3 percent rosavins. Dietary supplement makers throughout the world still hew to this standard.

Even before the discovery of rosavins, Soviet adaptogen research culminated with ADAPT, a mixture of extracts from *R. rosea*, a species of ginseng, and a berry called *Schizandra chinensis*. Hoping for a synergistic effect, the Soviets gave ADAPT to Olympic athletes, according to Ramazanov's self-published material.

The Soviets then decided to test ADAPT in their space program, a plan that enlisted Wikman and the Swedish Herbal Institute. Wikman and the Soviet scientists gave ADAPT to 60 sleep-deprived cosmonaut trainees. "Those tests went well," says Wikman. The mixture "had a very clear effect on mental-work capacity, problem solving, and short-term memory when the subjects were really, really tired after staying up for days." The mixture also helped normalize an elaborate measure of cardiac function in the sleep-deprived trainees. "So the decision was made to take it up, use it in space," Wikman says.

Cosmonaut Valery Polyakov, a physician, took ADAPT daily while commander of the Mir space station during his 14-month mission in 1994 and 1995, says Wikman. Wikman adds that Polyakov credited ADAPT with helping him endure the record-length spaceflight.

TO THE WEST About the same time Polyakov was taking herbs in space, Ramazanov was setting up shop just outside New York City. Working with a dietary-supplement maker, Ramazanov invested in a small laboratory and began importing rhodiola. He talked up its benefits whenever he got the chance.

The message spread, and in 2003, Mark Blumenthal, executive director of the American Botanical Council, a trade group based in Austin, Texas, trumpeted rhodiola as "the next herbal superstar" in an already lucrative market. Despite Blumenthal's proclamation, rhodiola hasn't cracked the top 20 herbs in sales at food and drug-stores even though it's widely available.

But Ramazanov's work has drummed up academic interest. Since the turn of the century, a growing number of reports investigating rhodiola have appeared in English-language journals. Several groups of researchers have found that, in the laboratory, rhodiola inhibits the spread of bacteria, prevents immune system damage caused by anticancer drugs, slows the division of cancer cells, and corrects enzyme irregularities in diabetic mice.

Meanwhile, Wikman and the Swedish Herbal Institute, which makes a rhodiola extract called SHR-5, have continued laboratory and human tests. In 2000, they reported that SHR-5 protects snail embryos from heat, copper, and oxidative stress. When given the herb extract, fewer of the embryos died after exposure to these stressors than did embryos not given the extract.

Also in 2000, Wikman and his colleagues in Russia published results from a randomized, double-blind trial of university students who took SHR-5 at the end of a semester. Students taking the herb for 20 days fared better on measures of fatigue and mental performance than did students who took a placebo. Another

(continued on page 189)

THE BREAST SOLUTION

Nature's nutrition keeps HIV at bay

BY CAROLYN BARRY

HIV, the virus that causes AIDS, is ravaging Africa. In some regions south of the Sahara Desert, more than 35 percent of the population is infected. Each year, as many as 700,000 children acquire HIV from their infected mothers during pregnancy, labor, or breast-feeding.

In developed countries, by contrast, mother-to-child HIV transmission has been virtually eradicated. Pregnant women take anti-HIV drugs to minimize the chance of passing the virus to their babies. Delivery by cesarean section removes the danger of HIV reaching a baby during birth. And use of infant formulas eliminates the possibility of infection through a mother's breast milk. As a result, fewer than 2 percent of babies born to HIV-positive mothers in developed countries become infected.

But in Africa, up to 40 percent of the children of HIV-infected mothers are either infected at birth or become infected soon afterward. Cesarean sections are too risky or simply unavailable in many African hospitals, and the World Health Organization (WHO) estimates that only 9 percent of pregnant HIV-infected women in sub-Saharan Africa receive anti-HIV drugs.

Moreover, researchers have concluded that a significant number of African babies acquire HIV infection through the very substance that protects them in so many other ways: breast milk.

SAFER OPTION — A Ugandan woman, at risk of AIDS because her husband has the disease, nurses her baby. Although breast-feeding can transmit HIV, in poor countries it often poses fewer other health risks than formula feeding.

J. STETTENHEIM/CORBIS

"We already know how to prevent breast-feeding transmission: Don't breast-feed," says Lynne Mofenson of the National Institute of Child Health and Human Development in Bethesda, Md. But that ideal is "not an option in [developing] countries."

In the developed world, with an abundance of clean water and easy access to medicines and health services, feeding infants on formula presents no unusual difficulties or dangers. But in Africa, where food may be scarce and women sometimes can't afford enough formula or don't have access to clean water, many infected women have tried to heed WHO advice to bottle-feed their newborns but have ended up supplementing their children's diets with breast milk.

Now, research is revealing a cruel irony. This part-formula–part-breast regimen may be the worst strategy of all for the babies it's supposed to protect. Recent studies show that supplementing breast milk with other food exacerbates the risk of HIV transmission from mother to child in several ways. In addition, babies don't get the full nourishment and disease-preventing benefits of breast milk, while being exposed to heightened risks of malnutrition and gastrointestinal diseases from inadequate formula and the polluted water with which it's sometimes mixed.

On the basis of mounting anecdotal evidence and, now, a large and lengthy study of HIV and breast-feeding, many researchers and health authorities have concluded that women in developing countries should return to feeding babies only breast milk in order to reduce their chances of HIV infection as well as save them from a host of other ills.

BREACHING THE BARRIER Studies have shown that children whose infected mothers don't get antiretroviral drugs or other interventions during pregnancy have a 15 percent to 25 percent chance of acquiring HIV before or during birth. If the child of an infected mother is fortunate enough to make it into the world HIV-free, he or she still has an additional 5-to-20 percent chance of picking up the virus through breast milk. The longer an infected mother breast-feeds, the greater the chance that she will give the virus to her child, studies show.

Viruses such as hepatitis B and hepatitis C can't pass through breast milk, but HIV finds a way. Some 45-to-60 percent of breast-milk samples from HIV-infected women contain the virus, researchers have found. A baby won't be barraged with HIV every time it breast-feeds, but since a child takes milk several times a day, each baby of an infected mother is presumed to be regularly exposed to HIV.

Further increasing the likelihood of HIV transmission are various types of tissue damage. Throughout the body, intact membranes are effective in blocking HIV. But ruptured, pierced, and even just inflamed tissues present breaches where HIV can slip into the bloodstream or invade immune cells that congregate in disturbed areas. Thin mucous membranes, such as those lining the vaginal wall, are especially vulnerable, which is why normal childbirth by HIV-positive women is risky.

Similarly, if the tissue lining an infant's gut is inflamed or if a baby

"Breast milk [on its own] is not really that transmissive."

— NIGEL ROLLINS, UNIVERSITY OF KWAZULU-NATAL

has sores in its mouth, HIV in breast milk has an easier infectious path. And when mothers acquire the common bacterially-caused inflammation known as mastitis, which blocks and inflames milk ducts, breast milk becomes "a much better conduit for HIV," says Tracy Creek of the Centers for Disease Control and Prevention (CDC) in Atlanta. Milk from an infected breast has a higher concentration of virus than milk from a healthy breast does, she says.

For these reasons, organizations such as the American Academy of Pediatrics have recommended since the mid-1980s that infected women in developed countries avoid breast-feeding. In 1992, WHO extended that advice to women in poorer areas, unless formula feeding was unsafe or impractical. Studies completed in the early 1990s, showing that more babies died from acquiring HIV during breast-feeding than died of diseases caused by formula feeding (*SN: 6/2/01, p. 340*), supported those recommendations.

"Avoiding HIV transmission at all costs was a reasonable position to take at the time," says Nigel Rollins, a physician at the University of KwaZulu-Natal in Congella, South Africa, who has studied HIV and breast-feeding.

Despite all this bad news, not all babies of infected mothers get HIV. In fact, 60 percent or more of babies born HIV-free and subsequently breast-fed survive the daily doses of the virus without picking it up. But the reasons remain murky. Examinations of HIV in expressed breast milk have revealed immune cells containing HIV as well as the virus on its own.

However, breast milk also contains HIV antibodies that inhibit the virus' passage into mucosal cells in the baby's gut and on into the blood. Other proteins, such as epidermal-growth factor, boost repair of breaches of the thin membrane separating the digestive tract from blood vessels. This probably bars some HIV from entering the blood.

Another protein that seems to inhibit HIV's operation include the broad-acting anti-infectious agent lactoferrin. This molecule occurs in high concentrations in colostrum, the fluid that a mother's breast produces in the days immediately after her baby is born. Also, milk contains proteins of a type known as mucins, which may protect infants against HIV. Mucins are also found in the lining of the gut and in saliva.

As in any person repeatedly exposed to HIV, however, these defenses can protect babies only so long.

STRUGGLE TO SURVIVE — An orphan family, headed by a 15-year-old, collects water from a stream in Swaziland. Many infants in Africa die for lack of clean water.

BREAST IS BEST About 8 years ago, researchers looking at vitamin A deficiency and HIV transmission in South Africa and Kenya suggested that exclusive breast-feeding lowered HIV transmission to babies, compared with mixed feeding. However, "those studies were not sufficiently rigorous ... to conclusively guide policy," Rollins says. Without hard evidence of an advantage for exclusive breast-feeding, a WHO-policy update in 2000 maintained the formula-feeding recommendation, he says.

To clarify the evidence, Rollins and his colleagues at the University of KwaZulu-Natal set out to determine whether exclusive breast-feeding might reduce HIV-transmission rates in the first 6 months of a baby's life.

The researchers didn't randomly assign women to breast-feed or formula feed, but studied healthy and HIV-infected women who chose to breast-feed only, bottle-feed only, or supplement breast-feeding with formula, milk, or solid foods.

After studying more than 2,700 women for 7 years, the researchers published their results in the March 31 *Lancet*. They found that babies fed exclusively breast milk had about a 4 percent risk of picking up the virus from age 6 weeks to 6 months. That was less than half the risk of HIV infection of babies fed with breast milk plus formula or other milk products. Moreover, babies fed solids as well as the breast milk were 11 times as likely to become infected as were breast-only babies. Only two formula-only babies became infected during the study, and both had been breast-fed before their mothers switched them to formula.

"What this research shows is that breast milk [on its own] is not really that transmissive," Rollins says. Older studies indicating that about 15 percent of breast-fed babies acquire HIV from infected mothers failed to distinguish between babies exclusively breast-fed and those who received food supplements, says Rollins.

Wendy Holmes, an HIV researcher at the Macfarlane Burnet Institute for Medical Research and Public Health in Melbourne, Australia, describes the work by Rollins' team as "extremely meticulously done." The strengths of the study, she says, are its large sample size and detailed, weekly observations of babies' feeding habits and the health of both mothers and babies. In a *Lancet* editorial accompanying the report, she points out that the study also accounted for potentially confounding data, such as the mother's education and socioeconomic status, whether HIV drugs were taken, and duration of labor. Measuring infection rates among children 6 weeks to 6 months of age made sure that the differences in infection rates between exclusive breast-feeding and mixed-feeding babies weren't attributable to pregnancy or labor, adds Holmes.

WORST OF BOTH WORLDS As for how formula and other food can increase the risk of HIV infection while not carrying the virus themselves, Holmes endorses the suggestion made by other researchers that large proteins and other molecules found in foods such as formula, cow's milk, and grain inflame a baby's immature digestive system.

"The newborn gut is meant to only have breast milk and is not really meant to see anything else," Holmes says. "So it can become irritated, especially with solids like rice and maize."

Inflamed areas in the mucosal membranes of a baby's gut would attract white blood cells, increasing the opportunity for HIV infection, Holmes says. Inflammation might also tend to open up gaps between the cells lining the membrane, letting more of the virus cross into the blood. A mother who feeds formula or other food part of the time and breast-feeds to fill in is therefore increasing her baby's vulnerability to HIV infection. On top of that, the same feeding regimen increases the mother's risk of developing a mild version of mastitis, because milk not emptied from the breast inflames the tissue. That inflammation encourages more HIV to move from the mother's blood into her milk.

The *Lancet* study indicates that mixed feeding is a double whammy. Getting an insufficient dose of nutrients from breast milk not only seems to increase the likelihood of HIV infection for babies but also leaves them vulnerable to malnutrition, diarrhea, and diseases carried in contaminated water.

Avoiding breast-feeding to prevent HIV infection poses other problems in Africa. Confirming previous results, the *Lancet* study showed that babies fed exclusively on formula were twice as likely as their breast-fed counterparts to die by 3 months of age from diseases other than AIDS.

"There are millions, millions of children per year who die from diarrhea, and breast-feeding is an incredibly important survival instrument," Rollins says. "We can honestly say with certainty that breast-feeding in comparison to formula feeding saves lives" in Africa.

At an October 2006 meeting in Geneva, WHO members refined the breast-feeding recommendation for HIV-infected women to emphasize that the first choice for babies during their first 6 months is exclusive breast-feeding, unless the conditions for bottle-feeding are "acceptable, feasible, affordable, sustainable, and safe." That is, women should exclusively breast-feed if they don't have access to clean water, good health care and medicines, and formula.

LOOKING AHEAD For women who do breast-feed their babies, the focus of research will now move toward making breast-feeding safer. One of the biggest challenges will be to make sure that women who want to breast-feed do so exclusively—something difficult to guarantee in practice. Factors outside a woman's control, such as her health, work responsibilities, or how well the baby breast-feeds might force her to supplement the baby's diet with nutrients from other sources. Rollins says that with the right education and support, women can, and do, breast-feed exclusively. While previous studies showed dismally low rates of exclusive breast-feeding, Rollins and his colleagues reported that, in their study, 83 percent of women exclusively breast-fed for 6 weeks, and 67 percent were able to keep that up for 6 months.

In studies under way in Botswana, HIV-infected women are being given antiretroviral drugs while breast-feeding. The evidence so far shows that the practice decreases the amount of virus in milk. Researchers in Tanzania and Rwanda presented the preliminary data at an AIDS meeting in Australia in July (*SN: 10/23/03, p. 270*). Other researchers are investigating possible advantages in feeding babies banked breast milk and in killing HIV by flash heating mothers' expressed milk.

> "We can honestly say with certainty that breast-feeding in comparison to formula feeding saves lives."
>
> — NIGEL ROLLINS, UNIVERSITY OF KWAZULU-NATAL

Researchers are also working on what to do when a baby reaches 6 months of age, the time when it's grown enough to require more nutrients than breast milk can supply. "We've reached remarkable consensus among experts" that breast-feeding is best during the first 6 months for babies of HIV-infected mothers in poor countries, says Jean Humphrey of the Johns Hopkins Bloomberg School of Public Health in Baltimore, Md., speaking from Zimbabwe. "The issue really now is the switch in the focus of what to do after 6 months." WHO currently recommends that mothers wean babies rapidly to avoid prolonged exposure to mixed feeding.

"We've come a long way in our understanding about how to reduce mother-to-child-transmission," Humphrey says. She points out that the United States has reduced its mother-to-child HIV-infection rate from as high as 30 percent to less than 2 percent. "You can do that in the developing world," she says. "It's just about trying to figure out how to make that work." ■

(continued from page 186)

study published in 2000 found an antifatigue effect of the herb among 56 physicians working night shifts.

In 2003, the Swedish-Russian group published a study of 100 male military cadets who took a single dose of SHR-5. After working all night, 40 cadets received a low dose of the extract, 40 a high dose, and 20 a placebo. The cadets taking either dose of the extract scored higher on a battery of concentration and mental-performance tests than did cadets taking the placebo.

Most recently, in the September-October *Nordic Journal of Psychiatry*, Wikman and coworkers in Armenia report a randomized, double-blind trial in people with mild-to-moderate depression. For 6 weeks, two groups of 30 patients took either of two doses of SHR-5 while a third group took a placebo. People taking either dose of the extract reported fewer symptoms on standard depression questionnaires at the end of the study than did those who took the placebo.

"I've been using it as an antidepressant for years now," says Columbia University's Brown. "But it's nice to have that validated in a clinical trial."

BROWN

HEALTHFUL HANDFUL — Psychiatrist Richard Brown holds a bunch of *Rhodiola rosea* during a 2003 expedition to Siberia. Brown recommends root extracts of the plant for treating depression and other ailments.

INCOMPLETE PICTURE Despite the increased academic interest in rhodiola, Wikman's team, which has a vested interest in its SHR-5 product, remains the only group sponsoring clinical trials. And getting a handle on exactly what rhodiola does inside the body is daunting. "Scientists have yet to advance a single theory that accounts for the diverse benefits of adaptogens," says Brown.

Whereas prescription drugs typically contain a single compound that works in a specific way, herbs contain many active compounds that act on the body via different, often subtle, mechanisms. Scientists have identified at least a dozen active components in rhodiola, including the rosavins and known antioxidants. Many more may remain unidentified, says Brown.

Dietary supplement companies in the United States have little incentive to invest in research, as the Food and Drug Administration doesn't require clinical trials for dietary supplements. Standards for marketing herbal products in Canada and Europe are more stringent. The National Center for Complementary and Alternative Medicine, part of the National Institutes of Health in Bethesda, Md., hasn't funded any rhodiola research.

"I think it's a valuable medicine, and I'd love to see more research," says Brown, who recommends various brands to his patients and who doesn't have a financial interest in any rhodiola product. "But I don't see much clinical research ever happening in the United States. Drug companies just aren't interested, and the [supplement] companies can't afford it." ■

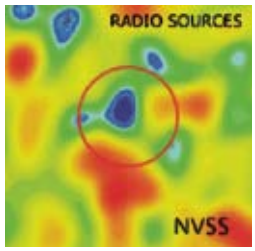
OF NOTE

ASTRONOMY

Cosmic void

Astronomers have discovered a billion light-year–long region devoid of matter, the biggest hole in the cosmos they've yet observed.

A void this large hadn't been predicted by the leading model of cosmic evolution, says Lawrence Rudnick of the University of Minnesota in Minneapolis. He and his colleagues base their new findings on a radio-wavelength survey of 82 percent of the sky using the Very Large Array in Socorro, N.M. The dearth of galaxies lies in the constellation Eridanus, the team reports in an upcoming *Astrophysical Journal*.



EMPTY Circled area in this radio map indicates a billion light-year–long region devoid of galaxies.

An earlier sky survey, based on data from NASA's Microwave Anisotropy Probe, yielded the intriguing result that the temperature of the cosmic-microwave background, the radiation left over from the Big Bang, is slightly lower in this patch of sky than in other regions.

Combining information from the two surveys, Rudnick and his colleagues suggest that the cool spot comes about because primordial radiation reaching Earth from that part of the sky has traveled through a region devoid of galaxies yet filled with dark energy.

First proposed by astronomers in 1998, dark energy makes the universe expand at an accelerated rate. In the absence of matter, dark energy causes photons from the microwave background to lose a tiny amount of energy, and therefore appear slightly cooler.

The team estimates that the void lies between 6 billion and 10 billion light-years from Earth. —R.C.

BEHAVIOR

SSRI use declines, youth suicides rise

Following public health warnings a few years ago about the possibility that antidepressant drugs could make young people suicidal, the number of antidepressant prescriptions for children and teenagers declined in the United States and the Netherlands. During the same period, youth-suicide rates increased in both countries, raising concerns that the much-publicized regulatory efforts backfired, a new study finds.

A team led by biostatistician Robert D. Gibbons of the University of Illinois at Chicago examined U.S. and Dutch data from 2003 to 2005 on prescription rates of selective serotonin reuptake inhibitors (SSRIs) to youngsters up to age 19. SSRIs include fluoxetine (Prozac) and other medications commonly used to treat depression. The researchers also tracked youth-suicide rates from 1998 through 2004 in the United States and through 2005 in the Netherlands.

As of 2005, SSRI prescriptions for kids and teens had decreased by about 22 percent in both countries after regulators issued warnings, Gibbons and his coworkers report in the September *American Journal of Psychiatry*. In the Netherlands, the youth-suicide rate increased by 49 percent between 2003 and 2005. The U.S. youth-suicide rate rose 14 percent between 2003 and 2004, the largest 1-year change in suicides for this population since federal researchers began collecting such data in 1979.

In a related study, national data collected by managed care plans from 1998 to 2005 show marked declines in rates of diagnosis and treatment of youth depression following the 2003 regulatory warning. Physicians didn't prescribe other psychoactive medications in place of antidepressants for depressed youth, note Robert J. Valuck of the University of Colorado, Denver and his colleagues. Their report appeared in the June *American Journal of Psychiatry*. —B.B.

EARTH SCIENCE

Meteor dust layers taint Antarctic ice

Two layers of ice recently found in an ice core drilled from East Antarctica are heavily contaminated with meteoritic dust—the first such extraterrestrial debris ever recovered from deep Antarctic ice.

At first, geologist Biancamaria Narcisi of the Casaccia Research Center in Rome and her colleagues thought the dark particles spread throughout each layer of ice were volcanic ash. As many as 18 layers of such ash have been found in the 3.26-kilometer-long ice core that she and other scientists have analyzed.

The newly described particles don't look like volcanic ash, however. Instead, their crystal structure and chemical composition match those of particles found in many meteorites. Many of the bits are 10 micrometers across or larger, much bigger than the 2-µm-or-smaller dust particles that waft to the region from distant deserts. Moreover, some of the particles are spherical and glasslike, signs that they melted as they tore through Earth's atmosphere.

Narcisi and her colleagues estimate that the debris-rich layers, found at depths of 2,788 and 2,833 meters, are about 434,000 and 481,000 years old, respectively. Finding comparable layers in other Antarctic ice cores could help calibrate the dating of those cores and thus pin down the ages of events chronicled in them, the researchers suggest in the Aug. 18 *Geophysical Research Letters*. —S.P.

GENETICS

One tall gene

Call the National Basketball Association. Scientists report finding a gene for height.

The gene, *HMGA2*, comes in two versions. On average, adults with two copies of the "tall" version tower almost a centimeter over those with two copies of the "short" version. Adults with one copy of each version fall in between.

Past studies of twins pegged variation in height to be about 90 percent genetic. Diet and other unknown environmental factors account for the rest of the variation.

In the new study, Michael Weedon of Peninsula Medical School in Exeter, England, and his colleagues at other institutions scanned the genomes of nearly 34,000 people of European descent. Two single-letter DNA changes associated with the *HMGA2* gene leaped out of the data as being most closely linked to height, the team reports online and in an upcoming *Nature Genetics*.

Although the scientists don't know exactly how the gene affects height, it appears crucial for bone growth during gestation and childhood. Also, mutations in the mouse version of the gene are known to stunt the animals' growth.

Many more genes influencing height remain to be found, say the researchers. They estimate that *HMGA2* explains only 0.3 percent of all variation in human height. —B.V.

RUDNICK ET AL., NRAO, AUI, NSF, NASA

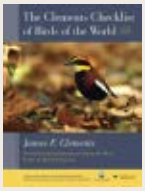
Books

A selection of new and notable books of scientific interest

THE CLEMENTS CHECKLIST OF BIRDS OF THE WORLD: Sixth Edition

JAMES F. CLEMENTS

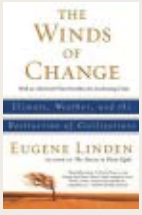
Clements dedicated his life to cataloging and protecting the world's birds. From the rare New Guinea yellow-legged flycatcher to the humble pigeon, Clements was fascinated by them all. In 1974, he published his first checklist, created with birders in mind. This sixth edition of that checklist remains true to the spirit of the original and incorporates the latest scientific findings. The book contains the birds' common and scientific names and regional distributions. It offers a comprehensive list of birds living today, organized by taxonomical family. Space is provided for readers to record the location and date of individual sightings. Also included are a list of extinct species, a country-by-country directory to where the birds now live, and references for the various bird families. Forewords by Jared Diamond and Anthony W. White. ***Cornell Univ. Press, 2007, 843 p., hardcover, $59.95.***



THE WINDS OF CHANGE: Climate, Weather, and the Destruction of Civilizations

EUGENE LINDEN

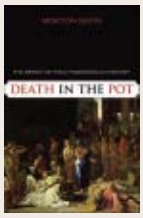
Anthropologists and historians who study the ascents and collapses of civilizations, Linden writes, often overlook a major factor: climate. The recent devastation of New Orleans by Hurricane Katrina illustrated the power of climatic events to alter the course of history. The author, an environmental journalist, outlines how the young science of analyzing ice cores enables scientists to determine climate trends going back 110,000 years. Those data and analyses of historical weather records are reshaping scientists' ideas about the interplay between people and their environment. For example, 4,200 years ago, people of the Akkadian civilization in the Fertile Crescent were abruptly driven from their homes by drought and famine that would last some 300 years. A mysterious event in A.D. 536—perhaps a comet or an asteroid impact—produced drought in Mesoamerica and famines in Asia and pushed waves of migration and plague across Europe and the Middle East. Linden includes the analysis of lakebed sediments to indicate how temperatures changed around the globe. He also looks at the role played by modern society in recent climate changes. ***Simon and Schuster, 2007, 319 p., paperback, $15.00.***



DEATH IN THE POT: The Impact of Food Poisoning on History

MORTON SATIN

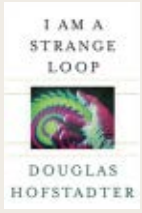
The ancient Israelites may have suffered not only from God's wrath but also from the consumption of toxic quail. Many Greeks and Romans succumbed to lead poisoning because the element, used in their cooking pots, leached into their food. And the madness of King George III could have been due to arsenic poisoning. In this book, molecular biologist and food-safety expert Satin reveals the role that foodborne illness may have played in world history. Before the Industrial Revolution, food supplies were often subject to contamination, and ailments such as gout and St. Anthony's fire (ergotism) were among the results. Satin describes what modern governments are doing to ensure a safe food supply. Despite these efforts, as the recent cases of *Escherichia coli* contamination of spinach have shown, tainted food remains a public health threat. Meanwhile new risks, such as food bioterrorism, are emerging. ***Prometheus, 2007, 258 p., b&w illus., hardcover, $24.00.***



I AM A STRANGE LOOP

DOUGLAS HOFSTADTER

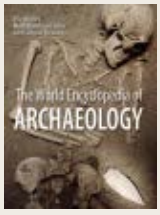
Hofstadter's *Gödel, Escher, Bach* was a popular treatise on the mysteries of consciousness. Despite its fame, Hofstadter says, the book didn't fully convey his intended message. With this second book, the author attempts to set things straight by revisiting his ideas about "I." He explains his notion of the sense of "I" as a loop within the brain that recognizes symbols, processes, and incoming information and organizes them into a cohesive sense of self. In a first-person narrative sprinkled with personal anecdotes and analogies, Hofstadter introduces readers to the philosophy of the mind. He explores the notions of self-reference, perception, and free will. Readers are asked to ponder whether such questions as whether consciousness is related to musical taste, and whether it's ever possible to put yourself in someone else's shoes. ***Basic, 2007, 412 p., b&w and color photos, hardcover, $26.95.***



THE WORLD ENCYCLOPEDIA OF ARCHAEOLOGY: The World's Most Significant Sites and Cultural Treasures

AEDEEN CREMIN, CHIEF CONSULTANT

Archaeology's value lies in its ability not only to locate and catalog artifacts but also to interpret historical trends that can shed light on humanity. Recently, the field has benefited from DNA sequencing, remote sensing, and three-dimensional computer modeling, all of which complement the time-honored "digs." This profusely illustrated guide presents the history of archaeology, defines its subfields, and considers some of its challenges, such as cultural-property laws and looting. Most of its pages are devoted to an atlas of the world's major archaeological sites. Scientists' findings at these sites have shed light on countless civilizations that flourished and disappeared, leaving behind magnificent, and sometimes mysterious, monuments and artifacts. ***Firefly Books, 2007, 399 p., b&w and color photos and illus., hardcover, $59.95.***



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LETTERS

Personnel question

In "E-Waste Hazards: Chinese gear recyclers absorb toxic chemicals" (*SN: 7/14/07, p. 20*), researchers found "astronomical concentrations" of deca-BDE in the residents of Guiyu, and the article cites studies showing that related PBDEs harm brain development in mice and rats. So, has any actual increase in brain-development problems been found in people in and around Guiyu?

JOANNE RAISNER NARAD, LOS ALTOS, CALIF.

The researchers know of no such health-effects assessment. They say that it would be hard to distinguish the effects of PBDEs from those of other factors in a worker's environment and that no scientist can ethically dose people with PBDEs to see what happens. —S. WEBB

Busting the clot buster

As an experienced emergency physician, I can assure you that physicians who choose not to use tPA for stroke are not, as characterized, "insufficiently trained or too conservative" ("Brain Attack," *SN: 7/14/07, p. 26*). There has been, to my knowledge, no study that has shown decreased mortality with the use of tPA for acute stroke. Most of the emergency physicians I know do their best to treat patients on the basis of the best available evidence and to avoid being caught up by marketing like the brain-attack program that ensnared this story.

DAVE ELLISON, PELICAN RAPIDS, MINN.

There is a lot of research going on in risk detection and stroke prevention. An example is magnetic resonance imaging to detect unstable carotid-artery plaque, which can rupture, block brain arteries, and cause a stroke. Let's try to prevent the stroke so that we don't have to attempt a rescue afterward.

NAYAK L. POLISSAR, SEATTLE, WASH.

Winners and losers

"Check on Checkers: In perfect game, there's no winner," (*SN: 7/21/07, p. 36*) stated that the last player with pieces on the board is the winner. This is not accurate. In fact, no pieces have to be jumped at all for a game to have a winner. The all-encompassing rule is that the last player who has no available move when it is his or her turn is the loser.

ROBERT VEITH, BRANDENBURG, KY.

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