

SCIENCE NEWS

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playing possum
honeybees decoded
dissolving medical devices
mastodon maulers

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pumped up

DUST DEVILS DO HEAVY LIFTING



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Cover With the aid of their internal electric fields, dust devils on Earth can pump tons of dust into the atmosphere. Similar electric fields inside Martian dust devils may trigger changes in atmospheric chemistry that sterilize the ground on that planet. (NASA) [Page 282](#)

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Genome Buzz

Honeybee DNA raises social questions

Scientists have officially unveiled the DNA code of the western honeybee, the first genome to be sequenced for an animal with ultrastratified societies.

The bees are among the select species in which a few individuals reproduce while others in the colony raise the young and do the chores.

The honeybee genome, the whole sequence of its DNA building blocks, shows some patterns that fit old ideas of social living plus some patterns that demand new thinking, reports the consortium of bee-genome researchers.

The scientists report the genome's highlights in the Oct. 26 *Nature*. More than 40 other analyses also appeared in journals including *Science*, the *Proceedings of the National Academy of Sciences*, and *Genome Research*.

"The sequencing of the honeybee genome is unquestionably a historic event," comments Ben Oldroyd, a bee spe-

cialist at the University of Sydney in Australia.

The honeybee's genome is the fifth to be sequenced among insects, says Gene Robinson of the University of Illinois at Urbana-Champaign, a founding member of the bee consortium. Geneticists first did the lab fruit fly, *Drosophila melanogaster*, and have since published reports on another fruit fly species, the malaria mosquito, and the silkworm.

Among the novelties of the honeybee, *Apis mellifera*, are its 170 genes for odor receptors. The lab fruit fly has 60. "Social life relies heavily on smell," notes Robinson.

The bees, however, carry fewer known immune system genes than the lab fruit fly or malaria mosquito does. That was a surprise, says Robinson, since social life brings extra risks of disease. Perhaps the honeybees compensate through particularly healthful behaviors, such as grooming, or perhaps some undiscovered genes drive their innate immunity. "Either way, it will be interesting," says Robinson.

The honeybees' famous royal jelly, the food that sets a larva on the road to becoming a queen instead of a worker, comes from proteins encoded by nine genes. The researchers compared them with other species' genes and concluded that they evolved from the so-called *yellow* gene, which plays a role in fruit fly pigment, for example.

In several groups of genes, such as those for circadian rhythms, the honeybee looks more like a vertebrate than the other sequenced insects. The honeybee also uses a full set of vertebrate-like genes for enzymes that regulate the action of other genes. Lab fruit flies use a different system for regulating genes.

Even though honeybees differ radically from fruit flies in their sex determination—honeybee males develop from unfertilized eggs and thus have only one copy of each

chromosome, whereas a fruit fly male gets chromosomes from both a father and mother—the two species' sex-related genes still show similarities.

Honeybees can perform remarkable feats of learning and memory, says Adrian Dyer of Monash University in Clayton, Australia. He predicts that having the honeybee genome in hand will spur "insight into how complex behavior patterns can arise in organisms with relatively simple brains."

The new research should also boost efforts to breed hardier honeybees, says Robinson. He says that U.S. commercial honeybee populations have shrunk by up to a third in the past 20 years, mostly because of an invasion of bee-killing mites. —S. MILIUS

Med-Start Kids

Pros, cons of Ritalin for preschool ADHD

The stimulant known as Ritalin displays pluses and minuses in preschoolers receiving the drug for attention-deficit hyperactivity disorder (ADHD), according to the first large, long-term study of the drug's effects in such youngsters.

In many cases, low doses of the medication, methylphenidate, safely quelled 3-to-5-year-olds' ADHD symptoms, the government-funded investigation revealed. However, preschoolers more often developed stimulant-related side effects, including irritability, insomnia, and weight loss, than older children with ADHD have in prior studies.

Preschoolers with ADHD also experienced slowed growth rates during the year after starting stimulant treatment, reports a team led by psychiatrist Laurence Greenhill of the New York State Psychiatric Institute in New York City. By the end of the 70-week study, these children were one-half inch shorter in height and weighed 3 pounds less than expected, based on average growth data for same-age U.S. children.

"Preschoolers with severe ADHD symptoms can benefit from [Ritalin], but doctors should weigh that benefit against the potential for these very young children to be more sensitive than older children are to the medication's side effects," Greenhill says.

His team presents its findings in five papers published in the November *Journal of the American Academy of Child and Adolescent Psychiatry*.

The researchers conducted the six-site study to address growing concerns over the safety and effectiveness of prescribing Ritalin to treat ADHD in preschoolers. Several sources of medication data have indicated that the number of prescriptions for Ritalin and other stimulants to 2- to 4-year-olds began increasing sharply around 15 years



R. MALESZKA

BEE INSIGHTS A western honeybee worker tends larvae, one of the social behaviors that makes the insect's sequenced genome so intriguing to biologists.

ago. However, it's unclear how many preschoolers with ADHD receive prescription stimulants.

ADHD affects about 2 percent of 2- to 4-year-olds. Symptoms include an inability to concentrate on tasks, restlessness, and extreme disorganization and forgetfulness.

The study began with 303 preschoolers who, according to teachers, parents, and clinicians, had exhibited moderate-to-severe ADHD symptoms for at least 9 months. The children and their parents first participated in a 10-week training program designed to alter ADHD behaviors. Only the 165 children who showed no gain from the training and whose parents consented to their treatment with Ritalin then received medication.

For the first week, each preschooler received daily Ritalin doses ranging from 3.75 milligrams to 22.5 mg. In contrast, elementary school students with ADHD typically receive daily doses of between 15 mg and 50 mg.

For the next year, preschoolers randomly received either the daily Ritalin dose that they had tolerated the best or placebo pills.

ADHD symptoms declined more in children taking Ritalin than they did in those taking placebos, the researchers report. However, only 22 percent of the children receiving Ritalin and 13 percent of those receiving placebos shed most or all of their ADHD symptoms, a difference that the analysis found wasn't significant.

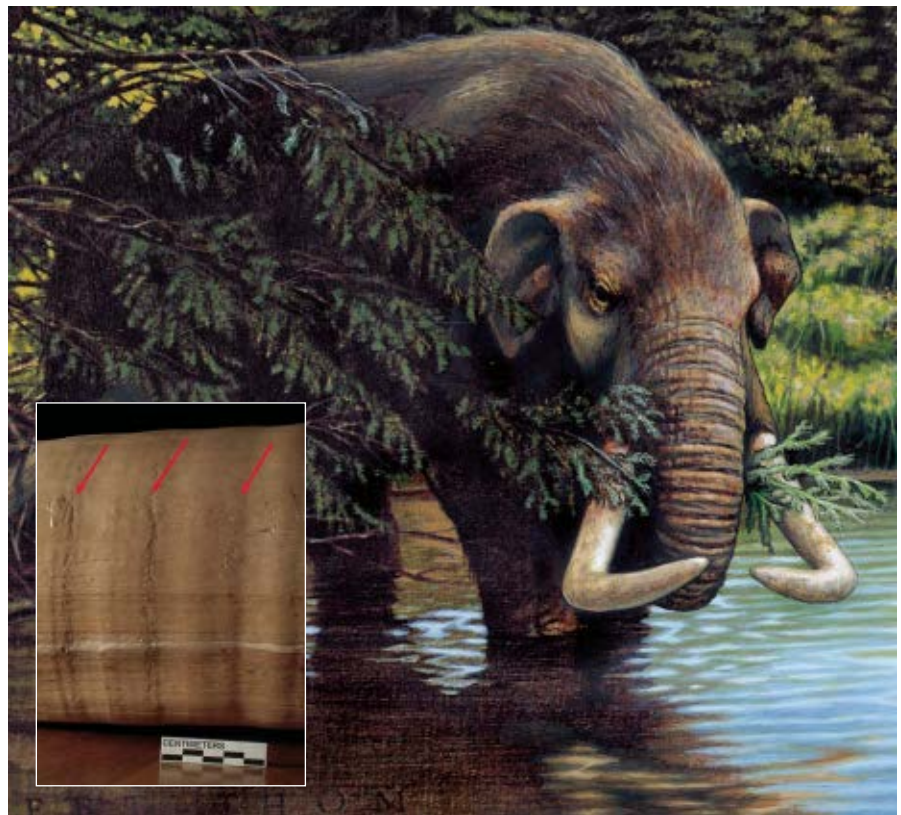
About 1 in 10 kids dropped out of the study because of medication side effects. No instances of mania, depression, or suicidal thinking occurred among participants.

The new findings emphasize the need for physicians to monitor preschoolers with ADHD who take Ritalin, remarks psychiatrist Thomas R. Insel, director of the National Institute of Mental Health in Bethesda, Md. —B. BOWER

Mastodons in Musth

Tusks may chronicle battles between males

Damaged segments on fossils of male mastodons' tusks hint that the creatures engaged in fierce combat with each other during a specific time almost every year of their adult lives, a new study suggests. That behavior parallels the annual period of



IT'S THE PITS Male mastodons had curved tusks that could have been damaged in competitions for mates. Inset of mastodon tusk shows rows of pits (denoted with arrows) reflecting the periodic damage.

heightened aggression and hormone-fueled jousting for mates in modern bull elephants. Scientists call the yearly period musth.

"American mastodons were not just docile herbivores that whiled away their time in forests and meadows," says Daniel C. Fisher, a paleontologist at the University of Michigan in Ann Arbor. "They were very aggressive animals."

Mastodons roamed North America from 4 million to 10,000 years ago. When Fisher examined the 11,480-year-old remains of a male mastodon excavated in 1999 in Hyde Park, N.Y., he noticed regularly spaced rows of shallow pits along the undersides of the long, curved tusks. A microscopic look at a cross section of one tusk revealed that the zones of dentin underlying the external pits were also damaged, Fisher reported in Ottawa last week at the annual meeting of the Society of Vertebrate Paleontology.

The lesions seem to originate at the boundary between the dentin and the cementum, the hard outer layer of the tusk. The cells that form new ivory lie along that interface at the base of the tusk, he notes.

The tusk damage always appears in ivory that formed between midspring and early summer of each year after the mastodon reached the age of 20. The ratios of chemical isotopes enable scientists to identify the annual growth patterns in the tusks of mammoths and mastodons.

Male mastodons fought each other in

several ways, previous analyses suggested. The most damaging blows may have resulted when one male dipped its head and then swung it upward, thrusting the tip of its curved tusk into the neck or skull of its opponent, says Fisher.

The impact of such a thrust, which could have incapacitated or killed an opponent, would also have jammed the tusk against the lower rim of its socket. That, in turn, would have crushed the ivory-making cells there and caused the scars, Fisher speculates.

"It's a plausible hypothesis," says James O. Farlow, a paleontologist at Indiana University-Purdue University in Fort Wayne. However, he wonders why similar features haven't been reported in the tusks of modern-day elephants.

Today's elephants have tusks that are only slightly curved, Fisher counters. Any jousting among modern males jams a tusk backward into its socket, not downward, so the impact is absorbed by a ligament that holds the tusk in place.

Fisher has noted similar tusk damage on the remains of a mastodon that was unearthed near Fort Wayne in 1968. However, those lesions appear to have been made only once every 2 or 3 years during the mastodon's adulthood. The presence of humans in the Fort Wayne area when that mastodon lived may explain that reduced incidence of damage, says Fisher.

Hunting may have lowered the number of male mastodons in the region, thereby reducing competition and the frequency of musth battles. —S. PERKINS

Lung Scan

CT may catch some treatable cancers

A controversial study suggests that computed tomography (CT) scans catch lung cancer early in smokers and other high-risk people, enabling doctors to intervene when they still can improve a patient's chances of survival. However, some scientists criticize the study's design for leaving many questions unanswered.

By the time lung cancer is typically discovered, it has spread to lymph nodes or other organs. As a result, only 15 percent of people with lung cancer survive 5 years after their diagnosis. CT scans have been proposed as a tool to find early lung cancers.

For the new study, which began in 1993, scientists did CT scans of about 31,000 generally healthy people and gave follow-up scans to more than 27,000 of them within 18 months. The participants, who were average age 61, were all smokers, ex-smokers, or people exposed to secondhand smoke or some other lung hazard, such as asbestos or radon.

In the two screenings, or in the interim, 484 participants were diagnosed with lung cancer. Of these, 412 had early-stage cancer confined to the lung. Most underwent surgery promptly after diagnosis.

As of May 2006, 92 percent of these early-stage patients who had surgery were still alive, says study coauthor Claudia I. Henschke, a physician at the Weill Medical College of Cornell University in New York City. Typically, only 50 to 70 percent of early-stage patients survive 5 years.

Although the study is a welcome foray into lung cancer screening, it doesn't establish CT scanning as an effective test, says pulmonologist Michael Unger of the Fox Chase Cancer Center in Philadelphia.

The study lacked a separate group whose outcomes the researchers could compare with those of people getting CT screening. Such a population could have gotten chest X rays or no screening at all.

Moreover, the biological nature of the cancers wasn't elucidated, Unger says. That means that the scientists didn't know whether they were catching aggressive cancers or just removing very slow-growing tumors that wouldn't have spread and ultimately killed the patient, says Denise Aberle, a radiologist at the University of California, Los Angeles School of Medicine.

Attacking a suspected tumor with an array of invasive medical procedures can lead to

“emotional, economic, and medical risks” for the patient, Aberle says. “Intuitively, we think that screening offers a better chance of survival. But we don't know [in this case] whether the potential benefit will outweigh the potential harm.” The CT scans in this study resulted in lung biopsies of 43 people who turned out to have no malignancies.

For now, Unger says, asking a doctor for a CT scan as a test for lung cancer is like “opening a Pandora's box.”

The screening debate probably won't be settled until 2009. That's when the first results will emerge from a large U.S. trial by Aberle and others comparing mortality from lung cancer in people screened with either CT scans or chest X rays. A similar trial is under way in Europe.

“This is only a salvo in the battle” to determine how best to screen for lung cancer, Unger says. “The war is not over.” —N. SEPPA

Vanishing Devices

Doctors implant disappearing stents, heart patches

Novel heart devices fashioned primarily from materials that the body can absorb or break down have made their debut in patients.

This week, cardiologists presented the first clinical studies of two such devices at a conference on cardiovascular therapies in Washington, D.C. The body absorbs most of one novel implant, a patch that can fix heart defects, and it degrades the other, a stent that can prop open a narrowed artery.

The vanishing implants offer potential advantages over permanent materials, which can trigger dangerous clots and impede the body's natural healing process.

In one study, interventional cardiologist Michael J. Mullen of the Royal Brompton Hospital in London and his colleagues treated people who had a defective opening in the central wall of the heart. Such defects can contribute to strokes (*SN*: 2/19/05, p.119).

Mullen's team used an experimental patch to plug the opening in each of 57 volunteers. The device, manufactured by NMT Medical of Boston, is composed of a cobalt-alloy frame that's covered with sheets of collagen. Tissue grows over the device, sealing the hole and absorbing the collagen. That makes a more natural patch than existing devices, which use sheets of synthetic material.

Six months after the procedure, 96 percent of the volunteers had no remaining

sign of the defect, Mullen reported at the meeting and online on Oct. 24 in *Circulation*. No serious side effects occurred.

Cardiologist Horst Sievert, director of the CardioVascular Center Frankfurt in Germany, says that bioabsorbability “is the major breakthrough of this technology.”

In a separate study, interventional cardiologists in New Zealand and Europe have implanted degradable stents into 30 patients who had developed dangerously narrow coronary arteries.

Currently, doctors treat such patients with metal stents, which are mesh tubes that prop open arteries.

The danger of an artery renarrowing lasts only about 6 months after a procedure, says study leader John A. Ormiston of the University of Auckland in New Zealand. So, an implanted metal stent, he says, “is a permanent solution to a temporary problem. It's like a cast on your arm after [a broken] bone has healed.”

That's a concern because blood clots, which can cause heart attacks, sometimes form on old stents.

The new stent is made entirely of polylactic acid, a polymer. That substance gradually degrades into lactic acid, which the body metabolizes naturally. Abbott Laboratories of Abbott Park, Ill., owns the stent and supported the study.

No major side effects occurred within a month after stent implantation, and the devices propped arteries open nearly as well as metal stents do, Ormiston says. His team plans to track the volunteers' health for 2 years. It will take the stents 2 to 3 years to disappear, he says.

Further studies need to ensure that a biodegradable stent can permanently reverse artery narrowing, says Raimund A. Erbel of the West German Heart Center Essen in Germany. If so, he says, this type of novel device “is the way of the future.” —B. HARDER

Trimming Down Cancer

Fat could hinder body's fight against disease

Fatty tissue secretes substances that make it harder for the body to battle cancer, a study in mice suggests.

Previous studies showed that obese people have excess risk of getting cancers such as those of the breast and colon. However, obesity changes many aspects of a person's overall health, so scientists aren't sure what

STATS
174,000
Estimated new lung cancer cases this year in the U.S.

facet of obesity is responsible for the increased cancer risk.

Several years ago, Allan Conney of Rutgers University in Piscataway, N.J., and his colleagues noticed that when lab mice were exposed to ultraviolet (UV) light and then given caffeine or encouraged to exercise regularly on a running wheel, they were less likely to get skin cancer than were UV-exposed mice that didn't receive these interventions. Since both caffeine and exercise decreased the animals' body fat, the researchers wondered whether fat itself might be the deciding factor in cancer susceptibility.

In a new experiment, Conney's team separated mice into two groups. Only one group of animals was placed in cages with exercise wheels.

After 2 weeks, all the animals were similar weights, but those in the running group had significantly more muscle and less body fat than the non-exercisers did.

After researchers exposed the animals' skin to UV light, lab tests showed that the light-damaged cells in the runners were twice as likely to die as were cells in the non-exercisers. This cell death stopped the majority of damaged cells from developing into tumors.

Working with some mice that had formed tumors, Conney's team found a similar effect: Tumor cells in exercisers were more likely to die spontaneously than were tumor cells in sedentary mice.

To make sure that these effects weren't purely due to physical activity, the researchers surgically removed a layer of fat from the bellies of some non-exercising mice, and then exposed them and other non-exercisers to UV. Twice as many UV-damaged cells and tumor cells died in the surgically lean animals as in the animals that had retained the fat. The team reports its findings online Oct. 23 and in an upcoming *Proceedings of the National Academy of Sciences*.

Conney and his colleagues suggest that body fat might be leaching some substance that keeps damaged and cancerous cells alive. "Fat secretes a lot of different substances—it's not an inert tissue," says Conney.

Jens Bülow, who studies obesity at Bispebjerg Hospital in Copenhagen, finds the researchers' speculation plausible. He notes that if further studies can track down the cancer-supporting substance, researchers might be able to develop drugs to block its action.

In the meantime, Bülow advises cancer patients not to try to lose weight. "It's weight loss induced by cancer that often kills these patients," he says. —C. BROWNLEE

A Whale's Tale

Puzzling marine compounds are natural

An 85-year-old vial of oil from a whaling ship has revealed that a mysterious group of organic chemicals resembling human-made compounds are naturally produced in the sea.

A decade ago, scientists monitoring marine mammals' flesh for pollutants began finding unknown organic compounds containing the halogen atoms bromine and chlorine. More than 20 such compounds were eventually revealed. That raised alarms because the compounds, as complex halogenated chemicals, structurally resemble the pesticide DDT and polychlorinated biphenyls (PCBs), which were once used in flame retardants.

Manufacture of those and similar chemicals began in the 1930s. But their production and use were banned in most countries decades ago, after they were found to be deadly pollutants. Because halogenated compounds break down extremely slowly, they persist in soil and water and accumulate in animal flesh.

Researchers wondered whether the recently discovered organic chemicals were manufactured or produced naturally. Symbiotic bacteria in ocean sponges, for example, produce chemicals similar to DDT and PCBs that deter fungal growth.

To investigate, Emma L. Teuten of the University of Plymouth in England and Christo-

pher M. Reddy of the Woods Hole (Mass.) Oceanographic Institution analyzed a whale-oil sample from 1921, before industry produced the first halogenated chemicals.

Their sample came from a jar of the translucent, yellow, odorless oil found on the *Charles W. Morgan*, one of the last whaling ships in operation. The ship is now preserved and on display in Mystic, Conn. "We were incredibly lucky to acquire it," Reddy says.

The scientists found 11 of the organic compounds in the whale oil. Because of the oil's age, the 11 compounds must have been produced naturally, the scientists conclude in their report online and in an upcoming *Environmental Pollution*.

"This by no means puts the chemical industry off the hook," Reddy says. Industry will probably be pleased to hear that it isn't responsible for the cleanup of additional compounds, he says, but the study "doesn't say that Monsanto, the main producer of PCBs, is not responsible for PCBs that are found in the environment."

The researchers argue that the naturally occurring compounds can shed light on the fates of the similar human-made ones. The recently discovered compounds must have been around far longer than DDT or PCBs, Teuten says, so researchers may be able to study the natural halogenated compounds to find out how industrial chemicals will continue to affect the environment.

Teuten and her colleagues say that they hope to determine where the new compounds are coming from and why they are being produced. The researchers are just beginning work to find out whether the compounds are toxic.

"I think the study is fantastic," says Gordon W. Gribble of Dartmouth College in Hanover, N.H. Their work "really does show that nature makes these compounds." —J. REHMEYER



A SHIP'S SECRET The *Charles W. Morgan*, one of the last whaling ships operating during the 19th and early 20th centuries, still carried whale oil from a late voyage. Analysis of the oil showed that some mysterious compounds that resemble DDT and PCBs are naturally produced.

E. PEACOCK

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WHY PLAY DEAD?

Rethinking what used to be obvious

BY SUSAN MILIUS

Gary Gerald studies animal movement, so when two female brown snakes in the lab had babies, he wanted to see them in motion. He watched them crawling on a solid surface, then moved the youngsters to water in a modified gutter. But the system didn't work as planned for the newborn snakes.

"I would pick the little guys up and drop them right in the water, and right when I dropped them, they flipped upside down. They stayed motionless. Their bodies were rigid so if you touched one part, they'd spin like if you touch a stick floating on the water," says Gerald. He concluded that this was a new example of an animal feigning death.

Baby brown snakes (*Storeria dekayi*) are the latest addition to the long list of animals that practice some form of the strategy scientists call extreme immobility. Gerald, a physiological ecologist at Miami University in Oxford, Ohio, described his findings in August at the annual meeting of the Animal Behavior Society.

The list of animals that play possum includes not only the Virginia opossum, of course, but also some 21 snake species and plenty of other creatures as different as bison on the prairies and brittle stars in the oceans.

Many of these animals freeze when a predator appears, and standard wisdom maintains that predators lose interest in prey that doesn't move. Yet some biologists now question that truism and are looking for a fuller explanation for the roles that feigned death might play in animal interactions.

It's not easy to study predator-prey interactions. Modern research guidelines discourage handing over birds and mice for carnivores to kill. So, the newest insights are coming from creatures that don't attract such scruples. For playing dead, insects are the new opossums.

POSSUM POSSIBILITIES "Rabbit Trancing" is the title of a Web page of the Minnesota Companion Rabbit Society, which is about rabbits as pets. On that page, the society's educator, Tonia Baxter, asks, "Have you ever cradled your rabbit in your arms, much like you would hold a baby, and thought she fell right to sleep?"

Instead of taking a trusting nap, Baxter explains, rabbits, like many other animals, freeze when handled in certain ways. Offline, Baxter says that results vary depending on the individual rabbit.

For a lot of animals, flipping upside down induces a freeze, says John Morrissey of Hofstra University in Hempstead, N.Y. While growing up on a farm, he'd impressed his childhood pals with his power to "hypnotize" chickens by turning them on their backs.

The technique comes in handy for adult marine biologists, too, says Morrissey. For example, when fishing in a 17-foot boat for foot-long juvenile lemon sharks near the island of Bimini in the Caribbean, he accidentally hooked a 14-foot tiger shark. He couldn't bear to leave a hook in such a magnificent animal.

He and his companions roped the thrashing shark and nudged it onto its back. In less than a minute, it quieted down, as hypnotized as a chicken. The animal lay so still that Morrissey set out his medical gear on the animal's stomach while he worked the hook out of the shark's mouth.

Extreme immobility can even occur during a cockfight, says Harold Herzog of Western Carolina University in Cullowhee, N.C. He has attended many fights while studying human relationships with animals. "Sometimes, a chicken would roll over dead, the owner would pick the chicken up, and suddenly it would be back to life," says Herzog. Exhaustion doesn't explain the reaction. When birds snapped out of the collapse, they'd walk around normally.

What makes a tiny parasitic wasp freeze was uncharted scientific territory when Bethia King of Northern Illinois University in DeKalb started studying *Nasonia vitripennis* wasps. Only 2 to 3 millimeters long, they cruise road kill looking for fly pupae into which they can inject their eggs. "Sometimes when you work with them, they just fall over on their backs," says King.

The wasps don't freeze when startled, but tapping their antennae or gently squeezing their abdomens does induce immobility, King and Harmony Leach, also of Northern Illinois, reported in the March *Journal of Insect Behavior*.

Researchers sometimes call these moments of extreme stillness "tonic immobility," making no claim about resemblance to death or implications about the behavior's function. Some animals, though, add special, cadaverous effects.

When a hognose snake that's facing a predator flips belly-up, its mouth opens and stays agape, sometimes oozing drops of blood. And the snake defecates or otherwise releases an unappetizing smell. "It's spectacular," says Gordon Burghardt of the University of Tennessee in Knoxville.

Grossly dead as the animal may look, Burghardt and Harry Greene, now at Cornell University, found that it's paying attention. Even snakes just 2 weeks old resurrect themselves sooner when a nearby



DEAD OR ALIVE — When an Eastern hognose snake notices the scary presence of a person, the snake flattens its body (top), writhes, and finally lies upside down with its mouth open (bottom).

human is looking away from them rather than directly at them.

When Gerald happened on a death-feigning hognose snake in the wild, he flipped it back to its normal, stomach-on-the-ground position. The snake rather damaged the cadaver illusion by rolling belly-up again.

Europe's grass snake puts on an even more realistic death act, says Patrick Gregory of the University of Victoria in British Columbia. When he caught his first grass snake years ago in France, it went limp. "I thought I'd accidentally killed it," he says. A death-feigning grass snake stays in character, not flopping back to its original position after it is turned over.

The relationships among the great range of freezing behaviors have yet to be clarified. "I see them as part of a continuum," Burghardt says.

Many questions remain: Are some of the activities seizures? A mental meltdown in response to disorientation? And how do some feigners remain conscious of vital details such as the gazes of observers?

DEATH VALUE Biologists for years held that predators tend to stop attacking once prey dies, or at least stops moving.

But are predators really that gullible? Theoretician Graeme Ruxton of the University of Glasgow, author of *Avoiding Attack* (2004, Oxford University Press), protests the assumption of a predator's "apparently maladaptive loss of interest."

And Morrissey likewise expresses skepticism: "If you're a pizza and you play dumb, I'm still going to eat you."

Only a few tests have examined whether immobility offers protection. For example, a 1975-reported experiment—which no one would do today—offered captive foxes a series of live ducks. Each of the 50 ducks went limp when a fox caught it. A few did survive; they were immobile but alive when the fox carried them to what seemed to be a storage site.

Gregory, who has been reviewing past literature, says that the 1975 paper suggests that death feigning might work for an animal tangling with a predator that typically caches prey.

A 1981 paper describes putting a cat into an arena with a pair of quail. When researchers induced one quail to freeze, the cat in 14 out of 16 tests went after the mobile bird. When both birds started out mobile, the cat sometimes left its first victim alive but immobile and moved on to attack the second bird. Ruxton points out that it's disadvantageous for predators amid multiple targets to spend too much time making sure that each conquest is dead.

More-recent work focuses on insects. Takahisa Miyatake of Okayama University in Japan got interested in death feigning while researching ideas for wiping out sweet potato weevils (*Cyrtus formicarius*) in Japan's southwestern islands. The weevils sometimes go still while lying on their backs, though to Miyatake's discerning eye, such details as parallel antennae reveal that they're still alive. He found that the feigning tendency goes through a daily rhythm, and feints are shorter when the weevils get hungry.

To study evolutionary aspects of such behavior, he and his colleagues switched to red flour beetles (*Tribolium castaneum*). The researchers selected 20 beetles that stayed immobile longer than most did and 20 beetles that did so only briefly or not at all. At first, the feints differed by only a few seconds. After 10 generations of selective breeding, though, the long feigners stayed immobile for

2 minutes, and the short feigners hardly ever went still. Death feigning is heritable, Miyatake and his colleagues concluded.

When the researchers offered the two groups of beetles to jumping spiders, the long feigners were more likely to survive. So, death feigning is beneficial, the team reported in 2004.

Miyatake suggests that beetles are combining some other defense with immobility. He and his colleagues have recently found that when attacked, some of the beetles release benzoquinone, which smells vile, at least to people.

Another approach to death feigning comes from a study of the pygmy grasshoppers (*Criotettix japonicus*) in Japan. When gulped into a frog's mouth, the grasshopper bends its big back legs straight down so they become the upright of a top-heavy T shape. Then, the grasshopper goes rigid.

Such "curious behavior," says Atsushi Honma of Kyoto University looked like death feigning. Yet he wondered why the grasshopper bothered to feign death when it was already in a frog's mouth.

Honma and his colleagues offered grasshoppers to a range of predators with different killing styles: Japanese quail, spiders, big mantid insects, and small frogs. Only the frogs attempted to swallow the grasshoppers whole. And only during frog attacks did the grasshoppers freeze into the rigid-T pose.

When researchers prevented grasshoppers from assuming that pose, small frogs were more likely to swallow the insects.

In contrast, when researchers offered 20 intact grasshoppers to a frog, 16 of them eventually escaped alive from the frog's mouth, Honma and his colleagues report in the July 7 *Proceedings of the Royal Society B*. Thus, Honma

says, the posture doesn't work by resembling death. It just makes the animal hard to swallow.

A bulky shape won't explain all death-feigning poses, Ruxton said in the April 13 *Nature*. However, he says, the Honma paper "will do the valuable service of shaking us from the rut of interpreting such behaviors uncritically as feigning death."

FISH TALE When fish biologist Michael Tobler and his family went to the Yucatán for a vacation, he hadn't planned on working. Yet he couldn't resist the temptation when, 2 days in a row, he saw dead fish lying on the bottom of a cenote sinkhole. Any fish that dies in the wild is usually quickly consumed.

Tobler, of the University of Oklahoma in Norman, spent the next 4 days underwater looking for dead fish.

One break came after he'd floated for 15 minutes staring at a dead-looking *Parachromis friedrichsthalii* cichlid. Smaller fish gradually drew closer until some began nibbling the cichlid's tattered fins. In an instant, the seemingly dead fish reared off the bottom and attacked one of the scavengers.

Although this cichlid is a death feigner, it's not trying to avoid predators, Tobler said in the March 2005 *Journal of Fish Biology*. It is itself a predator, and feigning death is the way that it hunts.

Biologists have described this strategy only twice before, but Tobler speculates that it might be more common than it seems. "Fish do a lot of cool stuff, and we don't know about it," he says.

The same, of course, could be said of creatures on land. And when animals are playing dead, scientists still have a long to go to explain why. ■



DRUG-FREE ZONE — This tiger shark off the Bimini coast isn't drugged. To attach a tracking device, researchers stilled the beast by turning it on its back.

SATANIC WINDS

Looking at dust devils on Earth and Mars

BY SID PERKINS

How to study a dust devil: Sit in your truck on a dry lake bed and wait for a mini-tornado to spring up within sight. Eyeball its path and guess where it's headed. Drive to a spot in that direction, shut off the engine, and hope that the vortex sweeps over you and your truckful of instruments.

"It's really passive-aggressive," says Gregory T. Delory, a planetary scientist at the University of California, Berkeley. Unlike the pursuit of monster Midwestern tornadoes, which can have two-by-fours and cows flying around in 500-kilometer-per-hour winds, dust devil studies don't have much excitement in the chase. The desert whirlwinds are typically only a few hundred meters tall and feature 60-km/hr gusts.

But within dust devils, electric fields can be surprisingly strong. New research suggests that those electric fields help the whirlwind lift material off the ground, enabling dust devils to pump enough dust into Earth's atmosphere to possibly affect climate (*SN*: 9/29/01, p. 200).

Results of these earthbound investigations have implications for explorations of other planets. On Mars, a desert planet where dust devils are common and unusually large, the whirlwinds result from severe atmospheric turbulence. Recent studies suggest that the electric fields in dust devils on the Red Planet are strong enough to cause chemical changes in the atmosphere there, including the creation of hydrogen peroxide. That reactive substance may sterilize Mars' surface, and its presence could explain some of the odd soil chemistry observed by the Mars Viking landers in the 1970s.

KICKING UP DUST Although quite different in size and strength, tornadoes and dust devils both result from atmospheric convection. When water vapor condenses inside a thunderstorm, the heat that's released drives fast-rising air masses that can spawn torna-

does. On a smaller scale, the more languid ascent of air warmed at Earth's surface—the thermals that buzzards and glider pilots use to gain altitude—produces the convection that triggers dust devils.

Packets of ground-heated air typically rise between 3 and 6 km before they cool, spread, and fall back toward the ground, says Nilton O. Renno, an atmospheric scientist at the University of Michigan in Ann Arbor. Within the large mass of circulating air, called a convection cell, vortices often form in the region between the upwelling center and the downdrafts along its outer rim, he notes.

When those swirling air masses touch the ground and pick up loose material, they become visible as dust devils.

In recent years, scientists have measured strong electrical fields inside dust devils. The airborne particles become electrically charged as they bump and scrape each other, says Renno. The lighter particles in the whirlwind tend to develop a negative charge, and the heavier ones, a positive charge. Because the light particles typically rise higher and faster than heavier ones, the separation of charges creates an electrical field that can measure more than 80 kilovolts per meter (kV/m). The whirling charged particles also create small magnetic fields that fluctuate between 3 and 30 times each second (*SN*: 2/8/03, p. 94).

Lab experiments indicate that the strong electrical fields inside dust devils help the vortices boost material off the ground, Renno and his colleague Jasper F. Kok report in the Aug. 28 *Geophysical Research Letters*. An electrical field would need to measure at least 150 kV/m to overcome gravity and lift a grain of sand in the absence of wind, the tests suggest. However, a field half that value would enable wind to pick up many particles, says Kok.

With the aid of their internal electric fields, dust devils pump a lot of dust into the atmosphere. Field tests suggest that a dust devil lifts about

1 gram of dust per second from each square meter of ground over which it passes, says Jacquelin Koch, an atmospheric scientist at the University of Michigan in Ann Arbor. Therefore, a large dust devil—about 100 m across at its base—can lift about 15 metric tons of dust during its 30-minute life span.

Dust devils may seem innocuous compared with the immense



HUGE BLOW — About 25 percent of the mineral dust in the atmosphere worldwide is lifted by dust devils, which can be several hundred meters tall and measure 100 m across at the base. To study dust devils, scientists scoot across dry lake beds in vehicles covered with instruments (inset).

dust storms that carry material across oceans (*SN*: 9/29/01, p. 200). However, the small whirlwinds, in aggregate, pump more material into the atmosphere than large storms do, says Koch. Massive dust storms sweep the world's deserts only a few times each month and contribute about 8 percent of the mineral dust that reaches the atmosphere each year. The hundreds of dust devils spawned daily in deserts throughout the summer together loft about three times that much, Koch and Renno reported last December at the American Geophysical Union meeting in San Francisco.

SPACE DUST On Earth, individual dust devils are usually no more than a nuisance. On Mars, however, such whirlwinds are larger and more common than their terrestrial kin. Martian dust devils may pose a threat to both robotic and human exploration.

As on Earth, dust devils on Mars arise from atmospheric turbulence. The temperature difference between the planet's surface and the atmosphere just above it can be much higher on Mars than on Earth, making the dust devils larger and stronger, says William M. Farrell, a geophysicist at NASA's Goddard Space Flight Center in Greenbelt, Md. He's a member of a NASA scientific panel assembled in 2004 to analyze risks to human missions to the Red Planet.

Dust devils within 10 km of a spaceship port on Mars could be a hazard for take-offs and landings, Farrell speculates. Before creating such a Red Planet base, space agencies should send landers, rovers, and other instruments to monitor dust devils and larger dust storms to determine whether those phenomena pose a threat, he and his colleagues suggested in a June 2005 report.

Many studies indicate that dust devils scour much of the Red Planet's surface, which covers as much area as Earth's continents do. Cameras on Mars landers have seen hundreds of the dusty whirlwinds, says chief rover scientist Steven W. Squyres of Cornell University.

The shadows of monstrous whirlwinds thick with dust have even been seen from craft orbiting Mars. The dimensions of those shadows indicate that some Martian dust devils grow to be several hundred meters across and up to 9 km tall, about 10 times the size of their cousins on Earth, says Paul E. Geissler, a planetary geologist with the U.S. Geological Survey in Flagstaff, Ariz.

The largest of the massive Martian whirlwinds, 5 km across at high altitude, can rival earthly tornadoes and "look like mountains" in the orbital images, he notes.

Evidence of past Martian dust devils can be detected from orbit too. A whirlwind leaves linear or looping trails as it sweeps away light-colored dust to reveal darker material, says Timothy I. Michaels, an atmospheric scientist at Southwest Research Institute in Boulder, Colo. Some orbital images have caught dust devils in the act of making such tracks. Similar tracks appear in satellite images of Earth's southern Sahara but aren't obvious to observers on the ground (*SN*: 5/8/04, p. 302).

Rover-based analyses of dust devil tracks on Mars indicate that most such trails are no more than a few micrometers deep, he notes. Because dust devils are pushed along by other weather systems, researchers can use the tracks to deduce the strength and consistency of the prevailing winds in areas of Mars.

No area of Mars may be safe from the whirlwinds. Satellites have recorded dust devil tracks in all regions of Mars and at all elevations—even inside the crater atop the 24-km-tall Olympus Mons, the largest volcano known in the solar system. However, some Martian regions seem to be more afflicted by the whirlwinds than others are, says Patrick L. Whelley, a geologist at Arizona State University in Tempe.

In the Red Planet's southern hemisphere, orbital images show an average of about 0.6 dust devil track per square kilometer, but pictures of the northern hemisphere show only one-tenth as many, Whelley and his colleague Ronald Greeley reported at the San Francisco meeting.

That disparity probably stems from the eccentricity of Mars' orbit, says Whelley. Summer comes to the northern hemisphere when Mars is at its farthest from the sun, about 249 million miles away. However, dust devil season comes to the southern hemisphere at the opposite side of Mars' orbit, when the planet is only 207 million miles from the sun. Because the southern hemisphere thus receives 40 percent more solar energy per square meter in summertime than the northern hemisphere does, dust devils are more frequent in the southern hemisphere.

Nevertheless, dust devil tracks appear even in the high latitudes of Mars' northern hemisphere, above that planet's equivalent of Earth's Arctic Circle. Scientists are now planning a Mars mission that will put a lander down at high latitudes, so they're closely scrutinizing orbital images to get an idea of the region's geology and weather, says R. David Baker, an atmospheric scientist at Austin College in Sherman, Texas.

None of the 1,558-or-so clear images of sites in that latitude band shows a dust

devil in action. However, about 10 percent of those pictures include dust devil tracks, says Baker. The trails range in length from 500 m to more than 16 km. He and his colleagues also reported their findings in December at the San Francisco meeting.

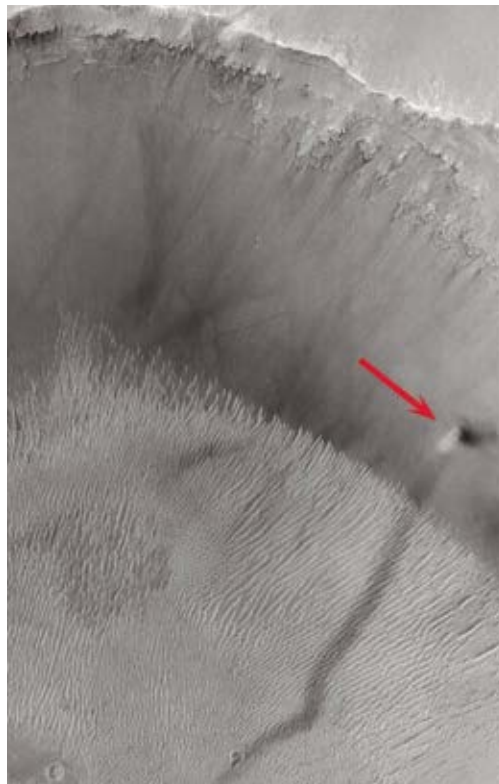
"We were surprised at the number of dust devil [tracks] we saw at high latitude," says Baker. "There was much more [past] activity than we expected."

The lander that will set down in this polar region will carry an atmospheric-pressure sensor as well as an upward-looking laser-radar device, so it will be equipped to study any dust devils that happen past the craft, says Baker.

STRANGE CHEMISTRY The denser an atmosphere, the more effectively its molecules block the flow of charged particles. On Earth, where the atmosphere is dense, electric fields inside dust devils aren't strong enough to accelerate dust particles to speeds where they strip electrons off molecules.

On Mars, however, the atmosphere is less than 1 percent as dense as Earth's, so speeding charged particles begin to break down atmospheric gases when electric fields build up to 25 kV/m. That's well below the value of the electric fields that build up in terrestrial dust devils, says Gregory T. Delory, a planetary scientist at the University of California, Berkeley. If Martian dust devils generate such fields, they may spark significant changes in atmospheric chemistry, he notes.

Electrons stripped from the gas molecules in Martian air



MAKING TRACKS — A Martian dust devil (arrow), seen from orbit as it climbs a crater wall, casts a small shadow and leaves a trail on the planet's surface.

would be accelerated by the electric fields. Lab tests suggest that those charged particles would attach themselves to carbon dioxide molecules to make negative ions and would split carbon dioxide into carbon monoxide and oxygen ions. The speeding electrons would also split water vapor into hydroxyl and hydrogen ions, says Delory.

Reactions of hydrogen ions, oxygen atoms, and hydroxyl ions produce hydrogen peroxide, H_2O_2 , the highly reactive chemical that's used on Earth to bleach hair and disinfect scrapes.

The typical lifetime of a hydrogen peroxide molecule in Martian atmosphere is about 2 days, says Delory. However, in the presence of large electric fields, hydrogen peroxide wouldn't remain in the atmosphere as a gas. So, the hydrogen peroxide that's formed inside a dust devil would either crystallize in the air and fall as snow or crystallize on the surface of the whirling dust particles.

Either way, the peroxide would quickly fall to the ground, where, if protected from sunlight by a shallow layer of dust, it could survive for more than 4 years. Delory, Renno, and their colleagues reported their analyses in the June *Astrobiology*.

The presence of dust devil-produced peroxide could explain

some of the odd results from a battery of soil chemistry experiments performed onboard the Mars Viking lander in the 1970s.

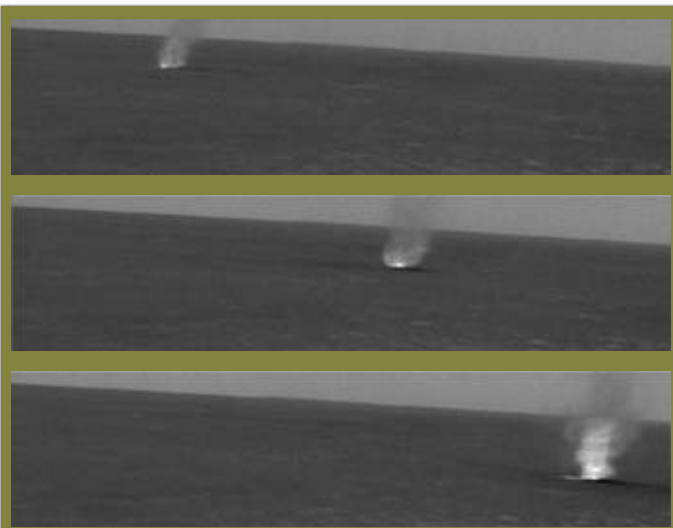
Those tests detected highly reactive chemicals but didn't find any sign of organic material, says Delory. Even if there hadn't been life on Mars, scientists expected to find traces of organic chemicals brought to the planet by meteorites.

Highly reactive peroxide would scour organic chemicals from Martian soil, says Delory. That process would make the surface of the Red Planet hostile to life. Furthermore, because the planet lacks an ozone layer, large quantities of ultraviolet radiation reach Mars' surface. Deep in the soil, where neither ultraviolet radiation nor peroxide infiltrates, however, life might survive.

"The jury's still out as to whether there is life on Mars,"

Delory notes.

Indeed, the jury's still out on many things about the Red Planet. For instance, "there's still a lot we don't understand about the chemistry of the atmosphere and soils of the planet," he adds. The researchers' theory about dust devils generating peroxide, Delory notes, could be verified by future Mars rovers or landers if they're equipped with an electric field sensor and can analyze Mars' atmospheric chemistry. ■



ENTER STAGE LEFT — These pictures, from a series of 21 images captured by the Mars rover Spirit, show a dust devil sweeping across the plains inside Gusev crater.

NASA, JPL

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ASTRONOMY

Feeling the heat of an extrasolar planet

Astronomers have for the first time measured the temperature variation between the lit and unlit sides of a planet outside the solar system—a difference that’s, literally, night and day.

Researchers used NASA’s infrared Spitzer Space Telescope, which measures the heat emitted from distant objects, to study a massive extrasolar planet that lies 40 light-years

from Earth. This so-called hot Jupiter, known as Upsilon Andromedae b, orbits its parent star at only about a tenth of the distance that Mercury resides from the sun.

Joe Harrington of the University of Central Florida in Orlando and his colleagues found that the temperature difference between the icy, dark side and the fiery, bright side of the planet is about 1,400°C.

The huge variation comes about, the researchers theorize, because one side of the planet always faces toward its star, while the other side faces away. The same side of the moon likewise always faces Earth. Unlike the moon, however, Upsilon Andromedae b is a giant ball of gas. Harrington and his collaborators describe their study online and in an upcoming *Science*. —R.C.

BIOLOGY

Itsy bitsy genome

Researchers have sequenced the smallest genome yet discovered, a string of DNA belonging to a species of bacterium that lives inside sap-eating insects’ gut cells.

This species, *Carsonella ruddii*, has a genome of about 160,000 base pairs, the building blocks that make up DNA. In contrast, people’s genomes are about 3 billion base pairs long.

Nancy Moran of the University of Ari-

zona in Tucson and her colleagues began studying *C. ruddii*’s genome to find out what functions these symbiotic bacteria might perform for their insect hosts. She notes that her team was “very surprised” when the sequence data showed that the microbe’s genome was so tiny.

C. ruddii seems to be missing hordes of genes previously thought to be essential to life, says Moran. For example, this microbe isn’t capable of making several enzymes important for replicating itself. Insect cells that house the bacteria appear to take up the slack, while *C. ruddii* reciprocates by manu-

facturing amino acids that aren’t in their hosts’ diets.

Her team writes in the Oct. 13 *Science* that because *C. ruddii* leans on its host’s cells for so many functions, it might eventually evolve into an organelle like a mitochondrion or a

chloroplast. Researchers suggest that those structures were once bacteria but now function as parts of cells. —C.B.

PHYSICS

Electromagnetism could ease the flow in oil pipelines

Oil drillers often heat crude oil or dilute it with gasoline to make it runny enough to flow through pipelines to refineries. Now, physicists find that a few seconds to minutes of exposure to a modest magnetic or electric field, instead of the standard treatments, sharply reduces crude oil’s viscosity for hours at a time.

The new oil-thinning technique could reduce the difficulty and cost of pumping crude oil, particularly from offshore rigs that feed pipelines passing through deep, cold waters, the scientists say.

Rongjia Tao and Xiajun Xu, both of Temple University in Philadelphia, observed that either a magnetic or electric field reduced the viscosity of crude oil that’s rich in paraffin wax. Another kind of crude oil rich in asphalt thinned from exposure only to electric fields, the researchers report in the September-October *Energy & Fuels*.

The team theorizes that the fields induce nanometer-scale paraffin particles to bunch in larger specks. Because

the larger but fewer specks are less likely to collide with each other, the fluid’s viscosity drops.

Asphalt particles responded too weakly to magnetic fields to bunch up, the researchers found. —P.W.

ZOOLOGY

Ivory-billed hopes flit to Florida

There’s no photo, but an ornithological search team says that its sightings, plus signs on trees and recorded sounds, suggest that a few ivory-billed woodpeckers still live along the Choctawhatchee River in the Florida panhandle.

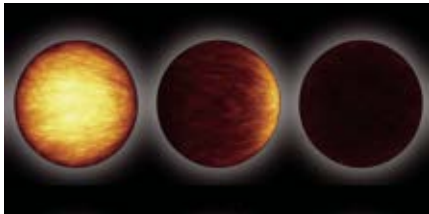
The big, showy species had been widely presumed extinct by the end of the 20th century. But hopes of the bird’s survival rose in 2005 when a Cornell University-led team released sound recordings and a blurry video as corroboration of their reported ivory-billed sightings in Arkansas. Other bird experts have disputed the video evidence, and the birding community now agrees only on the need for clearer proof of the species’ survival (*SN*: 3/25/06, p. 189).

Inspired by the news from the Arkansas swamp, ornithologist Geoff Hill of the University of Alabama in Auburn led two colleagues in May 2005 on a search of other possible habitats. After just 4 hours in the woods along the Choctawhatchee, the team saw what it identified as an ivory-billed woodpecker.

The researchers worked with staff of Daniel Mennill’s lab at the University of Windsor in Ontario to put sound recorders out in the woods. Two team members spent last winter camping there.

The searchers report 14 sightings. Their recorders captured 99 double knocks that match old accounts of ivory-billeds ‘hammering’ on trees, and they picked up 210 tinny bleats resembling past descriptions of the birds’ “kent” calls. The searchers also photographed what might be nesting holes and tree bark stripped by foraging birds. The evidence appears in the publicly available electronic journal *Avian Conservation and Ecology*.

The Florida researchers have posted on their Web site locations that they invite birders to search. However, the Choctawhatchee team warns that the swamps are unmapped and home to mosquitoes, poisonous snakes, and alligators. Nevertheless, “as soon as the leaves fall, we’re going back,” says Mennill. —S.M.



TWO FACED Sequence (left to right) shows the hot, bright side of the extrasolar planet Upsilon Andromedae b facing Earth and rotating away at a distance of 40 light years.

Infectious Diseases Society of America
Toronto, Ontario
October 12 – 15

BIOMEDICINE

Dengue strikes United States

Texas has been hit with the first-ever outbreak of dengue hemorrhagic fever in the continental United States. Sixteen people in Brownsville contracted this severe form of dengue fever late in 2005, and another nine people had a less severe form of dengue infection at that time, says physician Bryan K. Kapella of the Centers for Disease Control and Prevention in Atlanta, who presented these findings.

Dengue is a viral disease, carried by mosquitoes, that causes a high fever, headache, vomiting, muscle and joint aches, and rashes. Dengue hemorrhagic fever includes those symptoms plus small-blood vessel leakage, which can lead to shock, internal bleeding, circulatory failure, and death. There is no vaccine for dengue and no direct treatment.

In the U.S. outbreak, none of the patients died.

Dengue is most common in tropical regions. It's caused by four distinct—but related—viruses. A person can't be reinfected with the same type of dengue. However, dengue hemorrhagic fever seems to strike people who have been infected with one virus type and then later become infected with another.

Therefore, some Brownsville patients may have been previously exposed to a dengue virus. Indeed, authorities had recorded five earlier instances in which verifiable dengue fever had crossed from Mexico, but none had caused hemorrhagic illness.

The dengue virus is carried by *Aedes aegypti*, a day-biting mosquito that is partial to humans. The mosquitoes breed in open water containers and pools, Kapella says. He recommends stepped-up dengue surveillance along the border. —N.S.

IMMUNOLOGY

Flu vaccine seems to work for kids under 6 months of age

Babies younger than 6 months appear fully capable of responding to a flu shot, researchers find.

Such infants aren't typically vaccinated when influenza season arrives each fall, even though they routinely receive other vaccinations beginning at age 2 months. In the United States, flu shots are recommended for all children ages 6 months to 5 years.

"Children under the age of 6 months have actually the highest rate of [flu] hospitalization of any age group," says physician Janet A. Englund of the University of Washington in Seattle. "But there is no licensed vaccine for this group and no antiviral therapy available for them."

Englund and her colleagues randomly assigned 1,376 healthy infants, ages 6 to 12 weeks, to get either two doses of last year's flu vaccine or two inert injections. In both cases, the shots were 1 month apart.

Englund reported that a month after the second shot, blood analysis showed that 86 percent of the babies getting the vaccine had mounted an active antibody response against the H3N2 strain, and 50 percent had responded to the H1N1 strain. Those are the two most common strains affecting people. Babies receiving the placebo injections failed to make antibodies. The infants in the vaccine and placebo groups showed equal incidences of side effects, such as fever and irritation at the injection sites.

None of the babies developed 100 percent immunity, notes Kathleen M. Neuzil, a University of Washington physician, who has worked with Englund but didn't participate in this study. "But it's better than nothing, and what we're doing right now is nothing." —N.S.

VACCINES

Protecting against a difficult microbe

A team of scientists has devised a vaccine against *Clostridium difficile* by using the bacterium's DNA. Although the researchers so far tested the approach only in mice, the results could open a new line of attack against the bacterium, which has grown increasingly resistant to antibiotics in the past 5 years.

The researchers started with *C. difficile*'s gene for a toxin that causes diarrhea, fever, and abdominal pain. They then altered the gene so that it would enter human cells and there make a harmless fragment of the toxin. "It's like translating the DNA into a language the mammalian cells can understand," says study coauthor David F. Gardiner, an infectious-disease physician at the Weill Medical College at Cornell University in New York City.

To get the altered gene into mice cells, the team applied mild electrical stimulation to the animal's skin after injecting the synthetic gene. "That polarizes the cell and

moves the DNA into it," says Gardiner.

The cells secreted the toxin fragment, which drew the attention of the animal's immune system, Gardiner explains. The mice then manufactured antibodies geared toward neutralizing the toxin.

When exposed to drug-resistant *C. difficile*, all animals receiving the DNA vaccine survived, whereas all members of another group that received inert shots died within a day, Gardiner reported.

Resistant strains of *C. difficile* were responsible for 7,000 cases of illness in Quebec hospitals in 2003. Such strains have plagued other hospitals as well (*SN*: 2/18/06, p. 104).

The strain of *C. difficile* used in this study accounts for about 80 percent of the disease caused by this microbe in the United States, Gardiner says. Next, the researchers plan to test the DNA vaccine in hamsters, which are more like people in their reaction to *C. difficile* toxin than mice are. —N.S.

GENETICS

Gene might underlie travelers' diarrhea

Having a particular form of the gene that encodes the natural compound lactoferrin could predispose some people to travelers' diarrhea, a study finds. Normally, lactoferrin binds to some bacteria, thwarting their capacity to cause disease.

Roughly 40 to 60 percent of U.S. visitors to Mexico get diarrhea, usually from ingesting viruses or bacteria such as *Escherichia coli*, salmonella, and shigella, says Jamal A. Mohamed, a molecular biologist at the University of Texas Medical School in Houston. In search of genetic factors common to these individuals, Mohamed and his colleagues identified 718 people from the United States while they were on short-term stays in Mexico between 2002 and 2005.

There, 362 of the travelers became sick enough with diarrhea to visit a clinic. Four-fifths of the cases of diarrhea stemmed from bacterial infections, stool samples showed.

Blood samples from the travelers revealed that the sick ones were significantly more likely than the healthy ones to harbor a particular form of the gene encoding lactoferrin. The gene variant, called the TT allele, also showed up more often in white travelers than in blacks or Asians.

However, the form of a person's lactoferrin gene had no effect on how likely that person was to get sick from the diarrhea-causing norovirus, the researchers found. —N.S.

Books

A selection of new and notable books of scientific interest

THE MAKING OF THE FITTEST: DNA and the Ultimate Forensic Record of Evolution

SEAN B. CARROLL

Evolution has traditionally been observed in the changes in form and function that occurred among species in the fossil record. Carroll, a professor of genetics at the University of Wisconsin–Madison, explains that scientists are now equipped with a remarkably different method for detailing how organisms evolved: a record within DNA itself. Every feature, from the brightly colored plumage of tropical birds to the complex human brain, has a record of its development within the genetic code. By deciphering this code, scientists can begin to understand how these features evolved. Carroll explains that DNA in living things reveals not only new abilities and features but also how “immortal genes” have survived over aeons. He describes genes that are included in DNA but that are no longer used or have fallen into decay. The author also explains how, remarkably, evolution repeats itself so that many genes have changed in similar ways even though they existed in separate species. Finally, he looks at recent insights into how complexity developed in organisms and at the implications of rapid environmental change on populations. *W.W. Norton, 2006, 301 p., b&w illus. and color plates, hardcover, \$25.95.*

THE OTHER INSECT SOCIETIES

JAMES T. COSTA

An ant colony is often viewed as the prototypical insect society, notable for its unique and efficient division of labor. In this lengthy treatise, Costa, a professor of biology at Western Carolina University, explains how the idea of eusocial behavior (what occurs in most ant colonies) has dominated entomology and how it has led to the neglect of noneusocial insect societies. This latter category is further divided into four types of insect societies: maternal and biparental care, paternal care, fortress defense, and herds. Costa also explores the noneusocial arthropod phylum, which includes spiders, crustaceans, crickets, aphids, beetles, and moths. *Belknap, 2006, 767 p., color plates, hardcover, \$59.95.*

SECOND NATURE: Brain Science and Human Knowledge

GERALD M. EDELMAN

Epistemology, or the study of knowledge, was a largely philosophical exercise historically. However, recent advances in neuroscience have made more tantalizing than ever the prospect of scientifically explaining consciousness and how we come to understand the world, according to Edelman, the 1972 winner of the Nobel Prize in Physiology or

Medicine. He explains that although consciousness is a “first-person” experience, it is possible to study it with scientific objectivity. Furthermore, the implications of a scientific model of consciousness include the possibility of a device that could experience the world as people do. He explains that the brain is not a computer. Instead, brain connections are formed anew and



selected in response to inputs from the body and from the outside world. He reviews the latest research in brain-based approaches to consciousness, creativity, and mental illness. *Yale Univ. Press, 2006, 203 p., hardcover, \$24.00.*

WHY CHOOSE THIS BOOK? How We Make Decisions

READ MONTAGUE

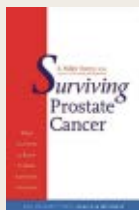
Every day, we make choices both profound and mundane. Some choices seem automatic, while others require deliberation. Montague, a professor of neuroscience at the Baylor College of Medicine, examines the brain processes behind decision making, from picking out what to wear in the morning to choosing whom to marry, and describes how the brain has evolved to maximize the efficiency of the process. In making these decisions, people create mental models of the world and

anticipate the outcomes of different courses of action, writes Montague. In this process, one can choose to override instinctual choices—those for food, sex, and safety. Montague examines how the brain can be conditioned to make certain judgments over others, how intangible benefits such as social approval become motivators, and how the decision-making process can go awry in people with mental illness. *Dutton, 2006, 336 p., hardcover, \$24.95.*

SURVIVING PROSTATE CANCER: What You Need to Know to Make Informed Decisions

E. FULLER TORREY

Each year, approximately 230,000 U.S. men are diagnosed with prostate cancer, as was Torrey, a research psychiatrist, in 2004. His subsequent search for information on treatment options led him to write this book. In it, he presents the most up-to-date research on the condition, defines commonly encountered terminology, and provides elaborate and personal descriptions of prostate cancer treatments: surgical, radiation, hormonal, and experimental. For each mode of therapy, Torrey includes information on which patients are good candidates, the actual process, the probable outcome, and possible complications. The guidelines for determining which treatment option is the right one for a particular person include such variables as the severity of the cancer, cost, life expectancy, and access to a good hospital. The book provides advice for dealing with common complications of prostate cancer and offers help in dealing with the possibility of recurrence. Finally, Torrey addresses what is known about the causes of prostate cancer. *Yale Univ. Press, 2006, 280 p., b&w illus., hardcover, \$25.00.*



LETTERS

Slow down a minute

“Braking news: Disks slow down stars” (*SN: 8/12/06, p. 109*) says that a magnetic linkage between spinning stars and the charged particles in the dusty disks that surround them slowed the spin of the stars, but says nothing about its effect on the disk. The law of conservation of angular momentum dictates that the angular momentum lost by the star would be transferred to the charged particles in the disk, presumably raising their orbits around the star. Did the researchers comment on this or the potential effects that it might have on planet formation?

JOHN A. BLACK JR., TEMPE, ARIZ.

Astronomer Luisa Rebull of the California Institute of Technology in Pasadena says that angular momentum is indeed being transferred from a star to its disk. However, she adds that her team, as a “humble observer,” was concerned only with the effect on the stars. —R. COWEN

Who’s watching whom?

I wonder if the researchers in “Underage Spiders: Males show unexpected interest in young mates” (*SN: 8/26/06, p. 133*) have made any observations of the prevalence of males mating with juvenile females when mature females are present in the environment.

CAROLYN CRAMOY, LAKE PLACID, N.Y.

Maydianne Andrade of the University of Toronto at Scarborough says that no information on that is available yet. She and her team didn’t know about juvenile-spider mating when they did earlier field research that might have offered insight. —S. MILIUS

Cooling trend

From literature I’ve reviewed, there can be significant differences between small-building cooling towers and large cooling towers—at a power plant, for instance (“Pathogen Preference: Infected amoebae flourish in cooling towers,” *SN: 8/26/06, p. 133*). A large cooling tower is designed with significantly more water circulation, flushing, and chemical treatment that reduce the potential for pathogens. The researchers should be encouraged to not lump all “cooling towers” in the same category.

SARA HEAD, VENTURA, CALIF.

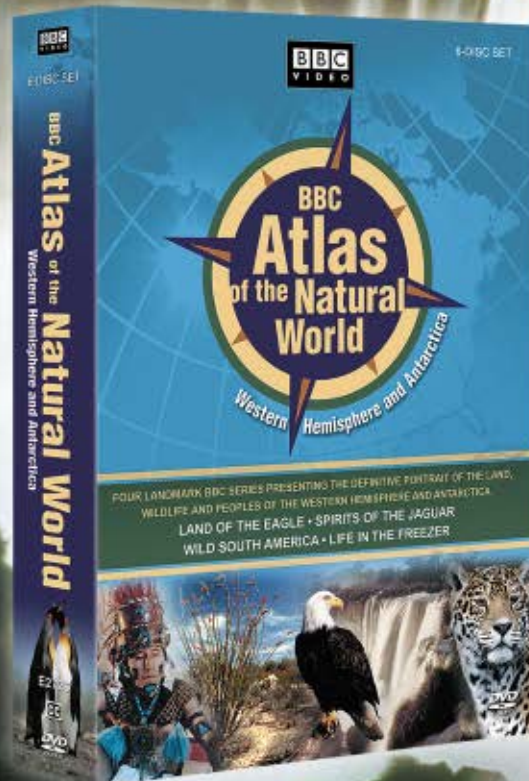
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