SCIENCE NEWS

THE WEEKLY NEWSMAGAZINE OF SCIENCE

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memory mechanisms

alloys by design

protein counters parkinson's

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DNA on display

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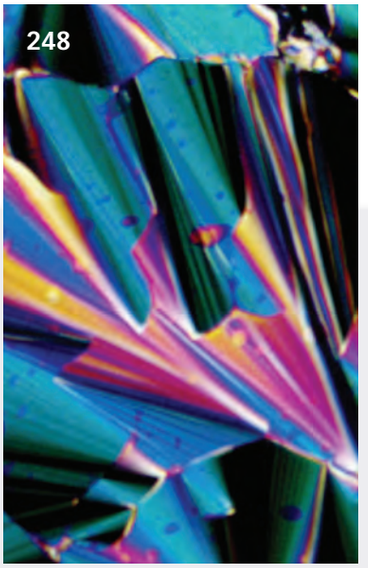

Features

This Week

Of Note

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Cover In the half-century since the discovery of DNA's double helix structure, researchers have found myriad ways to image the genetic material, including this microphotograph of DNA in a liquid crystalline state. (Davidson/FSU)
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Invent by Number

Researchers predict, then produce superior titanium alloys

Ingenious people have produced alloys since ancient times. By trial and error, they mixed metals and other elements until the whole came out better than any component alone. In recent years, some scientists have said that alloy development is a mature field with little room for improvement.

This week, however, researchers report a new method for making titanium-based alloys with many qualities far superior to those in any alloy previously known.

The team originally intended to develop materials for automobile parts, says Takashi Saito of Toyota Central Research and Development Laboratories in Nagakute, Japan. Instead, he and his coworkers wound up with materials that Saito says are too expensive for mass production in automobiles but have unusual properties suitable for a new generation of precision screws, eyeglass frames, medical devices, sporting goods, and spacecraft parts.

The alloys are strong yet unusually elastic, so they can deform more than other alloys and still return to their original shape. Engineers can also readily mold or bend the materials at room temperature into various shapes, a property called superplasticity.

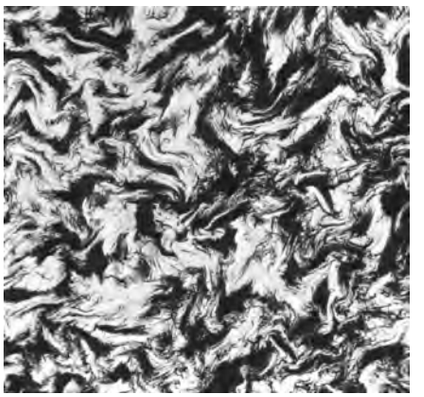
The materials also possess two characteristics desirable in machine parts that experience wild fluctuations in temperature, such as those in a spacecraft. While most metals expand with any rise in temperature, the new alloys expand very little between −200°C and 300°C. Moreover, conventional alloys deform different amounts at different temperatures, but the new materials show about the same deformation whether it's −200°C or 300°C.

Saito and his coworkers report in the April 18 *Science* that they devised calculations with which they can predict what combination of elements would make an alloy with these properties. The researchers determined that a desirable titanium-based alloy must meet three criteria, which they call "magic numbers," that are based on quantum mechanical calculations reflecting the behavior and arrangement of atoms and electrons.

The scientists add that an alloy meeting the criteria must be cold worked, or deformed by compression at room temperature, before it shows the extraordinary properties.

So far, Saito and his colleagues have made several titanium-based alloys that fit these criteria and possess the desired properties. The materials all include oxygen, and one, for example, also contains niobium, tantalum, and zirconium.

The new alloys' properties are "remarkable," says Gary Shiflet of the University of Virginia in Charlottesville. In particular, he says, their superplasticity could eliminate the need for expensive machining techniques when shaping titanium alloys into products.



SAITO

ALLOY THERE **A new titanium-based alloy containing four other elements has a marblelike microstructure after the material is deformed through compression.**

Perhaps more importantly, says Shiflet, the new report demonstrates the power of a computational method to predict alloys that never would have been made through trial and error.

Now, Shiflet asks whether the magic-numbers approach applies to other important classes of alloys, such as the nickel-based ones. "We will try it soon," says Saito. —J. GORMAN

Between the Sheets

In reactors and nanotubes, errant atoms get a grip

Reach out and touch each other. That's something that carbon atoms in adjoining layers within graphite aren't supposed to do—even in the cores of nuclear reactors where graphite blocks take a beating from neutron radiation.

New atomic-level simulations in England challenge that expectation. The findings, if confirmed, may revise not only the way that specialists handle spent nuclear-reactor cores but also how technologists build novel, nanometer-scale carbon structures.

Graphite has a crystal structure consisting of many one-atom-thick carbon sheets known as graphene. The spacing between sheets is more than twice that between atoms within the sheets, so the forces between sheets are extremely weak.

Now, Rob H. Telling of the University of Sussex in Brighton and his colleagues find that carbon atoms near neutron-punched holes in graphene make surprising, transient movements into the zone between layers. As they briefly dangle there, many atoms from adjacent sheets meet and form strong bonds, the researchers suggest.

These and other unexpected bonds that the simulation predicts modify properties ranging from a graphite crystal's size to its electric and thermal conductivities, Telling says.

In the May *Nature Materials*, he and his colleagues describe a surprising set of irregularities that showed up in computer simulations of a 64-atom, two-sheet portion of a graphite crystal.

Their report "sheds significant new light on an issue which has been studied for some 50 years but still remains poorly understood," comments Kai Norlund of the University of Helsinki. "If the results are eventually verified, this work should become a seminal paper in the field."

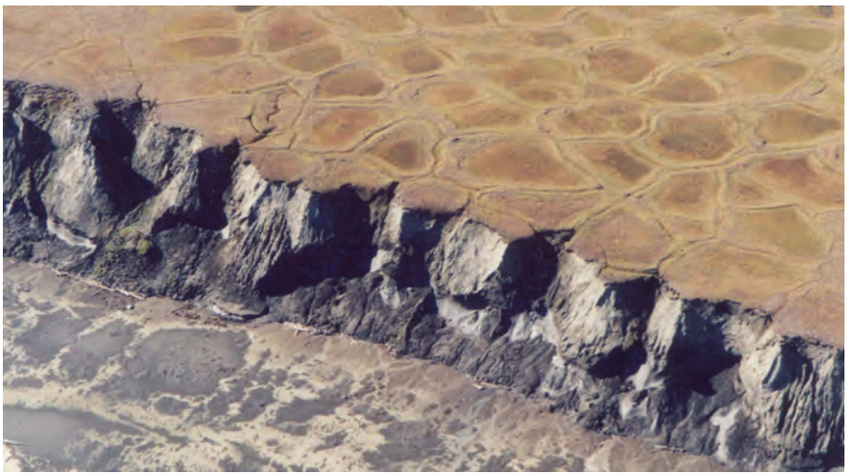
Scientists have long known that the graphite used to slow down neutrons shooting from the fuel in old-style nuclear reactors accumulates crystal defects that store energy. The potential danger of that energy was demonstrated in 1957 by the world's third-worst nuclear accident, the Windscale fire in Sellafield, England. Too-sudden release of energy stored in graphite defects made the Windscale reactor core catch fire and unleash significant radioactivity into the air.

While the nuclear-power industry has changed the type of reactors in use, it still must dispose of some 150,000 tons of irradiated graphite as defunct reactors are dismantled. The nuclear-power company British Nuclear Fuels partly funded the Sussex study in a quest for deeper understanding of radiation-induced defects in graphite. That information could improve disposal methods to avoid a sudden release of energy.

The new work has also struck a chord in an up-and-coming industrial sector—the Lilliputian world of carbon nanostructures. By revealing new atomic arrangements caused by irradiation in graphite, the simulations may aid scientists using radiation,

specifically electron beams, to engineer graphitelike nanostructures such as carbon nanotubes (*SN: 2/15/03, p. 110*).

"I am very excited about this," comments David Tomanek of Michigan State University in East Lansing. Experimenting with such radiation-induced defects will have an important effect on nanotechnology, he predicts. —P. WEISS



ICY TOMB Soil from this permafrost plain, shown in an aerial shot along Siberia's Arctic coast, has yielded identifiable DNA of animals and plants that lived up to 400,000 years ago.

Fertile Ground

Snippets of DNA persist in soil for millennia

Minuscule samples of sediment from New Zealand and Siberia have yielded bits of DNA from dozens of animals and plants, some long extinct. This genetic material, which includes the oldest DNA sequences yet found that can be traced to a specific organism, could help scientists reconstruct ancient ecosystems in those regions.

Nearly every cell of an organism carries DNA, the genetic information that researchers can use to identify species. Scientists usually study DNA extracted from living tissue or from preserved remains, says Eske Willerslev, a molecular biologist at the University of Copenhagen. However, his new research suggests that some soils may hold stockpiles of ancient DNA even if they don't include identifiable fossils.

For part of the project, Willerslev and his colleagues analyzed samples of permafrost drilled from several sites along a 1.2-kilometer stretch of Siberia's Arctic coast. The sediment cores, up to 31 meters long, included material dating from modern times to about 2 million years ago. The cores contained ice, soil, pollen, and plant rootlets, as well as small groups of unidentifiable cells.

Two-gram samples of sediment up to 30,000 years old included DNA from eight living and extinct animal species, including lemmings, hares, horses, reindeer, bison, musk oxen, and woolly mammoths. DNA extracted from sediment as old as 400,000 years matched the genetic signatures of at least 28 modern and ancient species of trees, shrubs, herbs, and mosses. Researchers didn't find DNA in the older sediment samples, says Willerslev.

Although the scientists don't know how animal DNA ended up locked in permafrost, Willerslev speculates that the genetic material came from cells that creatures shed in their feces.

The scientists also looked at samples of silt taken from a cave in New Zealand and sand taken from within and around an ancient bird's bone unearthed from a coastal dune there. From these 600-to-3,000-year-old sediments, the team identified at least 29 plant species, three types of extinct flightless birds called moas, and an extinct parakeet. They report their results in an upcoming issue of *Science*.

"This is a startling finding, if it's true," says David M. Lambert, a molecular biologist at Massey University in Palmerston North, New Zealand. Similar but preliminary efforts by his group haven't yielded penguin DNA from Antarctic soils or moa DNA from New Zealand sediments, he notes.

By extracting and analyzing the DNA in small amounts of sediment, scientists might determine what animals have been present in a particular area, contends Hendrik N. Poinar of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. However, at some sites, the mixing of soil layers over time could complicate attempts to reconstruct ancient ecosystems, he adds. —S. PERKINS

Neural Recall

Brain area may support fact and event memory

A small, inner-brain region called the hippocampus boasts a well-earned reputation as a memory hub. However, researchers disagree about whether the hippocampus specializes in remembering only experiences or instead coordinates recall of both experiences and factual information.

Support for the structure's double-barreled role comes from a group of six adults who suffered rare brain damage limited largely to the hippocampus. The analysis appears in a pair of reports in the April 10 *Neuron*.

"It looks like the human hippocampus is normally needed for semantic [factual] memories as well as for episodic [event] memories," says Larry R. Squire of the University of California, San Diego in La Jolla, who directed the investigations.

Passage of time loosens the injured hippocampus' cloaking of both forms of memory, Squire adds. All six brain-damaged patients remembered facts and events from more than a decade before their injuries occurred. They largely lacked recollections for material encountered in the 10 years before hippocampus damage and in its aftermath.

The patients, ages 36 to 64, had developed brain damage and memory loss after age 30 as a result of medical conditions such as viral encephalitis.

The first study explored factual memory. Five of the patients and 12 adults with uninjured brains answered multiple-choice questions about notable news events that occurred between 1950 and 2002.

Then, all six patients and 14 adults with healthy brains heard a list of famous and fictitious names. Famous names referred to people who became well known before 1970. Half remain alive today, and half had died between 1990 and 2001. Participants decided whether each name referred to a famous person and, if so, whether that person was still alive.

Patients remembered little about news events that happened after they suffered brain damage or in the 10 years before, Squire's team found. However, patients and healthy adults alike recalled much of the news from the distant past and identified most of the famous people they had known about for decades. Only the patients, though, couldn't remember which famous people had died since 1990.

In a second study, the six patients with hippocampus damage and two others with broader injuries to the brain region that

includes the hippocampus reported detailed autobiographical memories from childhood and adolescence. Their reports contained as much detail, including factual information, as those of 25 healthy adults. Previous studies had documented amnesia in these patients for personal events that occurred in the years shortly before and after their injuries.

In a commentary published with the new studies, Wendy A. Suzuki of New York University says the findings contrast with an earlier report that three children with hippocampus damage retained enough new factual knowledge to perform adequately in school.

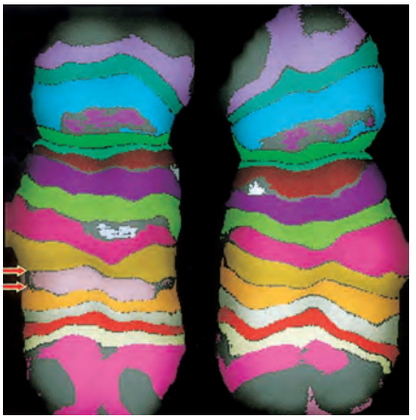
The brain may undergo dramatic reorganization to shore up factual memories after hippocampus damage in childhood, Suzuki proposes. It's also possible that even without marked brain changes, memories of day-to-day experiences in the classroom enable such children to pass their tests, Squire says. —B. BOWER

Radiation Marks Chromosomes

Plutonium leaves genetic fingerprint

By examining specific types of long-lasting genetic rearrangements in blood cells, researchers have found a way to measure a person's past exposure to plutonium radiation. Biophysicist David J. Brenner of Columbia University, who helped develop the new technique, says it could reveal health effects of radiation from radon and other sources.

Radiation comes in two broad classes. Densely ionizing radiation from plutonium and radon burrows microscopic tunnels through living tissues and knocks things out of kilter along these tracks. Sparsely ionizing radiation from gamma rays and X rays distributes its effects more diffusely, like the pattern from a shotgun rather than a rifle.



M.P. HANDE ET AL.

RADIANT COLORS In an example of intrachromosomal aberration, a normal portion of the chromosome (between red arrows, left) is missing from the chromosome at right.

The difficulty of quantifying past exposures to these two classes of radiation has been a stumbling block for researchers working to assess health risks associated with radiation.

In search of a biological marker for densely ionizing radiation, Brenner and his colleagues in Russia and Singapore focused on genetic irregularities known as stable intrachromosomal aberrations. These anomalies, which can persist for years without harming the cell, form when a single chromosome suffers multiple breaks and, while repairing itself, reverses or loses a piece of DNA.

The researchers studied chromosomes taken from blood cells of 26 former workers at the Mayak nuclear plant in Russia. Some had received large doses of densely ionizing radiation while processing plutonium. Others, who had maintained the reactor, faced sparsely ionizing radiation from gamma rays.

Brenner's team applied dyes known as fluorochromes to a single pair of matched chromosomes from each of more than 100 cells from each volunteer. The dyes adhere to specific regions of the chromosome to produce a distinct pattern of painted bands. When their computer identified a chromosome with an unusual banding pattern, the researchers chalked up an intrachromosomal aberration.

The researchers also used a related method in which each chromosome in the normal genome is dyed a different color. Then they could identify abnormalities in which DNA had been exchanged between, rather than within, chromosomes.

Mayak workers highly exposed to plutonium had 55 times as many stable intrachromosomal aberrations as their reactor-based counterparts had, Brenner's team reports in the May *American Journal of Human Genetics*. Individuals in the two groups showed similar numbers of abnormalities resulting from swaps between chromosomes. Because past research has suggested that the groups had similar total exposures to radiation, these results suggest that stable intrachromosomal aberrations primarily reflect densely ionizing radiation, Brenner says.

The new study is the first to show a biological fingerprint specific to that form of radiation in people, says Michael Cornforth of the University of Texas in Galveston. Such a marker might distinguish between the health effects of densely and sparsely ionizing radiation in victims of atomic bombs, he says.

Applying the new technique to research on radon gas may be a challenge, cautions epidemiologist Jonathan M. Samet of Johns Hopkins University in Baltimore. Because plutonium chemically mimics calcium, the body incorporates it into bones, where it can irradiate immature blood cells in the marrow at close range, he says. Radon, which is typically inhaled and expelled without being absorbed, primarily affects lung tissues and may therefore leave a different fingerprint on blood cells. —B. HARDER

Moving On

Now the human genome is really done

Coinciding with celebrations of the 50th anniversary of the discovery of DNA's double helix structure, an international consortium of scientists declared this week that the deciphering of the human genetic code is now truly complete.

In June 2000, prodded by the successful human-genome-sequencing effort of a biotech company, the publicly funded consortium reported to President Bill Clinton that it had finished a high-quality draft of the human genetic sequence (*SN: 7/1/00, p. 4*). This week's announcement reflects efforts since then to polish that draft by eliminating gaps in the recorded sequence of the so-called bases that make up DNA and increasing accuracy to the point where that sequence now has at most one mistake every 100,000 DNA bases.

The human-genome sequence produced by the consortium is "almost error free," says Robert Waterston of Washington University in St. Louis.

The sequencing, which cost several billion dollars and took more than a decade, was finished "under budget and ahead of schedule," says Francis S. Collins of the National Human Genome Research Institute in Bethesda, Md., one of the consortium's leaders.

At a press conference announcing the completion of the project, Collins and other investigators outlined future genetic-research plans, such as investigating how much one person's DNA varies from another's. —J. TRAVIS

Protein Pump

Experimental therapy fights Parkinson's

At first glance, people with Parkinson's dis- ease appear to have damaged muscles, as evidenced by tremors and rigidity. But in

reality, their problem is a loss of brain cells needed to produce and regulate dopamine. Among its other duties, this compound enables the brain to send signals to muscles.

Scientists report in the May *Nature Medicine* that bathing the surviving dopamine-making neurons with a natural protein that induces nerve-fiber growth reverses some symptoms in Parkinson's patients. The protein, called glial-cell-line-derived neurotrophic factor (GDNF), is plentiful in children but dwindles with age, tests in animals suggest.

Five patients, average age 54, received GDNF for up to 18 months. A group led by Steven S. Gill of the Institute of Neurosciences in Bristol, England, embedded two hockey-puck-size pumps loaded with GDNF under the skin of each patient's abdomen. The pumps were refilled with GDNF by monthly injections.

The implanted devices sent a regular flow of GDNF up a tube to the person's head and into the putamen. This brain region, central to movement, is starved for dopamine in Parkinson's patients.

Within 3 months, movement had improved in all five patients. They had been unable to move at all during roughly one-fifth of each day before the treatment began, but that problem disappeared after 6 months of GDNF. Curiously, three patients who had previously lost their sense of smell recovered it after 6 weeks of GDNF, says coauthor Clive N. Svendsen of the Waisman Center at the University of Wisconsin–Madison.

He cautions that some of the gains could stem from a "placebo effect," in which patients expecting to improve do so. However, brain scans of these patients at 6, 12, and 18 months after surgery to implant the pumps showed that dopamine supplies in the putamen improved over that time, Svendsen says. Patients suffered few side effects from the treatment.

Don M. Gash of the University of Kentucky in Lexington says this preliminary study of GDNF is encouraging. "If this lives up to its promise, it'll be the first example of a [brain-cell-nourishing] factor being successful in clinical testing," he says.

Studies in animals over the past 10 years have shown that GDNF can induce beleaguered dopamine neurons to sprout tendrils from axons, their natural extensions, Gash says. This sprouting increases the dopamine in the putamen, and the new tendrils boost the number of connections between neurons. These changes make signaling between brain and muscle cells more efficient.

The biotech company Amgen in Thousand Oaks, Calif., makes GDNF. The firm is currently conducting a similar trial with 32 Parkinson's patients. —N. SEPPA

Fishy Paternity Defense

Bluegill dads: Not mine? Why bother?

Bluegill sunfish have provided an unusually tidy test of the much-discussed prediction that animal dads' diligence in child care depends on how certain they are that the offspring really are their own.

When researchers presented male bluegills with phony evidence of cuckoldry, the dads slacked off on nest defense, says Bryan Neff of the University of Western Ontario in London, Canada. Later, reassured of their paternity, the fish grew fiercely protective, Neff reports in the April 17 *Nature*.

The idea that genetic relatedness affects how liberally parents invest in their offspring makes sense theoretically, but it's been tricky to test, says David Westneat of the University of Kentucky in Lexington, who also studies parental care. However, he calls the new study "a really focused, strong experiment" and "the best evidence to date."

The bluegill (*Lepomis macrochirus*) occurs across much of North America. In the Ontario lake that Neff studies, most males take 7 years to mature. Then, 100 to 200 hefty nest-builders gather, swishing their tails so that each sweeps out a depression, virtually rim-to-rim with his neighbors'. Schools of females show up for a day of egg laying. The dads fertilize the eggs, and the females swim off. The male spends the next week guarding his 12,000 to 60,000 offspring without any break for foraging.

About 20 percent of males mature when only 2 years old and spend their lives siring offspring in other males' nests. When small, these cuckolders hide nearby and zoom in at a strategic moment to fertilize eggs. When the cuckolders grow bigger, they develop femalelike coloration and mannerisms and "enter the parental male's nest in drag," says Neff.

To see how males react to questionable paternity, Neff placed four young cuckolder males in clear containers around each of 34 randomly selected nests. The containers kept the sneakers from siring offspring but gave the nest builders an eyeful of apparent rivals. The day after the bluegills spawned, Neff dangled a container with a pumpkinseed sunfish, which preys on eggs and fry, and scored the ferocity of the dads' defense.

After the eggs hatched, Neff repeated the defense test. His earlier work had shown that males can't judge their relatedness to eggs but can sniff out the paternity of fry. Neff predicted that after the males recognized that the apparent cuckolding hadn't done any damage, they would change from lackadaisical defenders to ferocious ones. His tests showed that, indeed, they did.

In another experiment, Neff swapped out about a third of the eggs from 20 males' nests and measured defensive behavior before and after the eggs hatched. After a male sniffed the unrelated fry, his ferocity declined.

The trouble with other experiments, says Westneat, has been that researchers often didn't know the cues that the animals use to judge paternity. The beauty of the new work, he says, is that Neff figured out and manipulated the cues. —S. MILIUS

M.R. GROSS/U. TORONTO

DAD'S NEST Among a crowd of protective fathers, the big bluegill male in the foreground hovers over his egg-filled depression.

HAPPY ANNIVERSARY

Fifty years after Watson and Crick's insight, scientists continue to take a close look at DNA's double helix

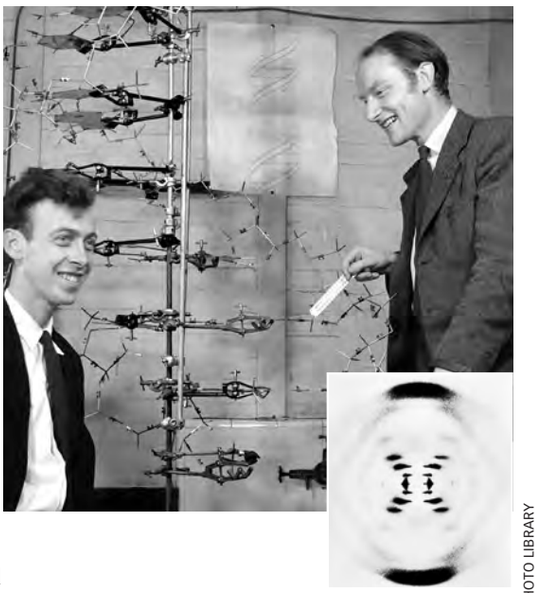
BY JOHN TRAVIS

On April 25, 1953, a brief research paper appeared in the British scientific journal *Nature*. Fifty years later, it's one of the most famous publications of all time and often considered the start of the molecular biology and genetics revolution that continues today. In that report, two young scientists at Cavendish Laboratory in Cambridge, England, proposed what they called a "radically different" structure for DNA, the material that scientists of the time had recently concluded stored an organism's genetic information. The pair argued that the DNA molecule resembles a spiral staircase. In the proposed arrangement, two strands are twisted together and connected at each step by a pair of so-called chemical bases, one jutting off each strand.

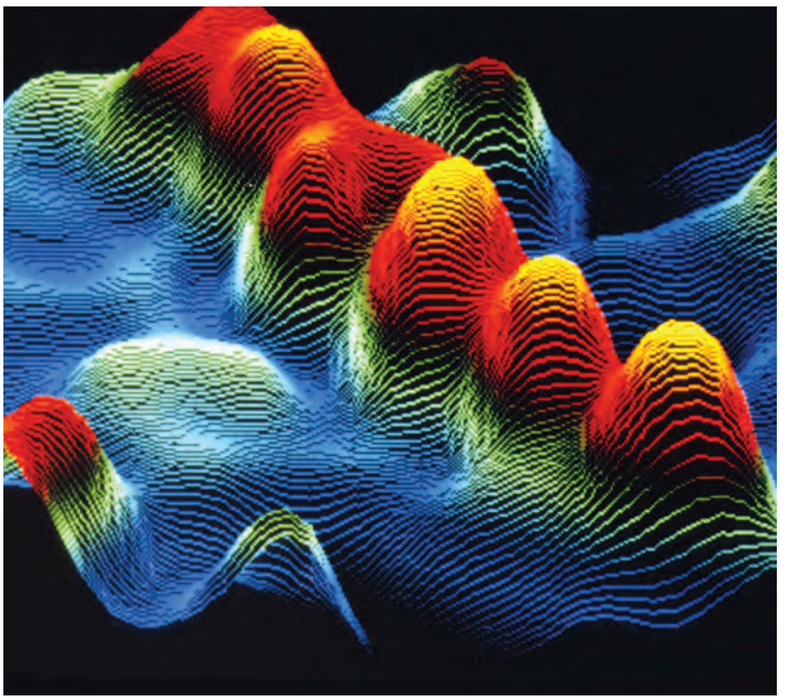
Such a structure hinted at the solution to another major riddle of biology: how a dividing cell copies its DNA so each daughter cell gets identical genetic information. The two strands could simply unwind, separate, and each make a new opposing strand according to the string of chemical bases it carries.

"It has not escaped our attention that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material," noted James D. Watson and Francis H.C. Crick.

On the eve of the 50th anniversary of the double helix's grand debut, *Science News* presents a gallery of images depicting the DNA molecule and, in one case, the genetic information it encodes. ■

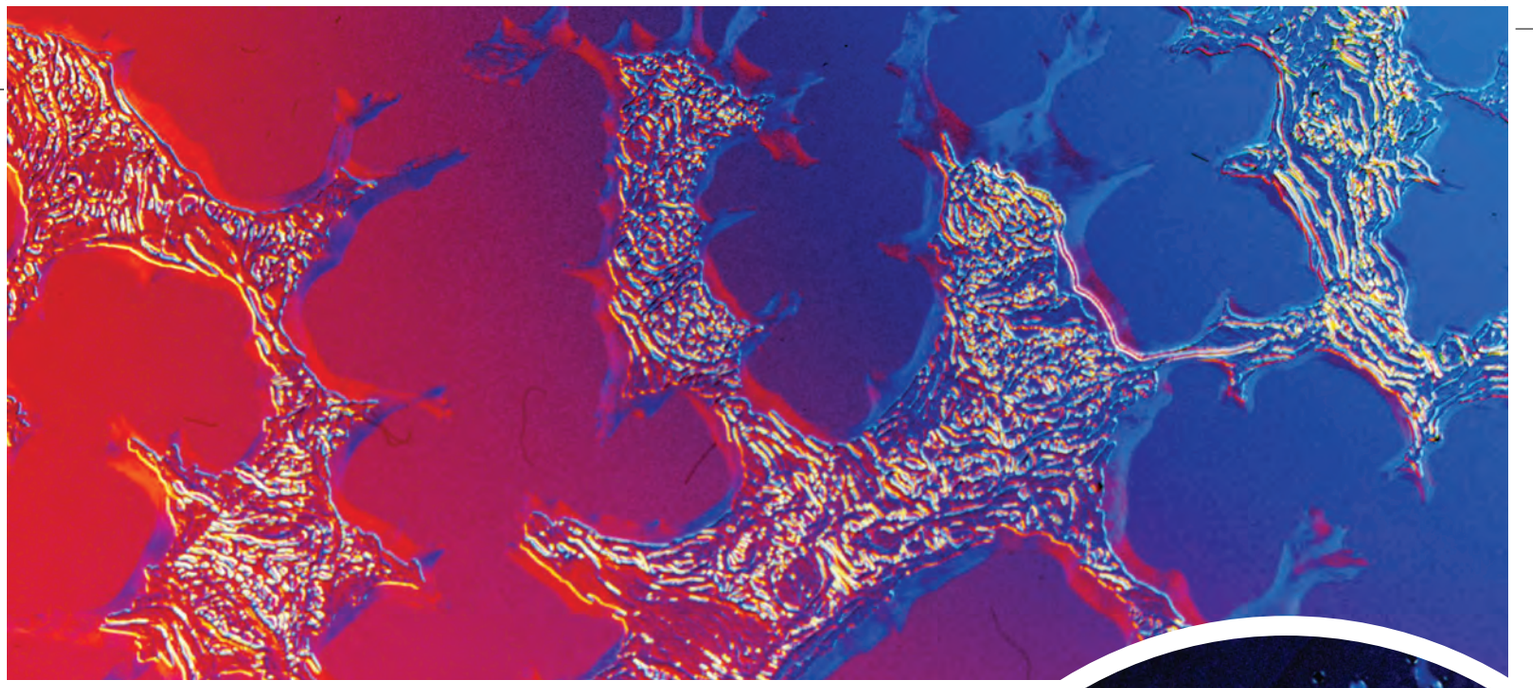


FIRST LOOK *(above, inset) The historic X-ray image of DNA taken by Rosalind Franklin of King's College in London in 1952. Though supplied to Watson and Crick without Franklin's knowledge, the image was an important clue to DNA's molecular arrangement as a double helix. The 1953 photograph (above) shows Watson (left) and Crick posing with one of their original models of DNA.*

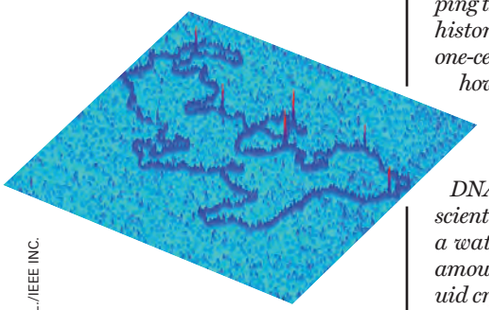


SURFACE TRACE *(left) In the late 1980s, researchers began to study DNA with a scanning tunneling microscope (STM). In this method, a sharp tip establishes an electric current between it and a target below that depends on the distance between them. By moving to maintain a steady current, the STM's tip can map an object's surface. In this false-color image, the DNA double helix is evident as the diagonal ridge of orange mounds. Scientists had hoped that STM imaging could distinguish among DNA's four bases so it could give a direct reading of the sequence of bases on a DNA strand, but the technique's resolution wasn't good enough.*

A. BROWN/PHOTO RESEARCHERS, INC.; OMIKRON/PHOTO RESEARCHERS, INC.; LAWRENCE LIVERMORE LABORATORY/SCIENCEPHOTO LIBRARY

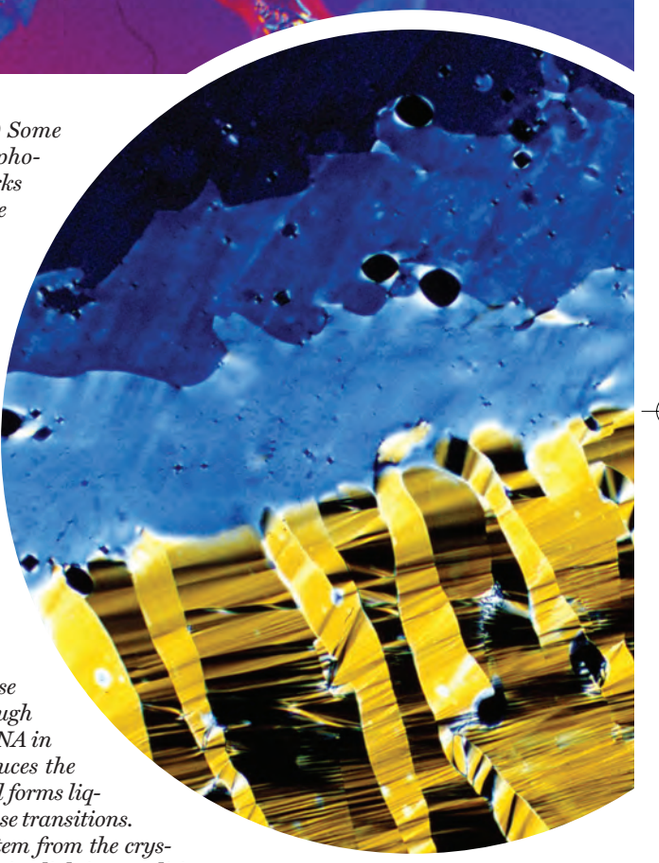


SPECIAL SITES (*below*) *The fine metallic point of an atomic force microscope (AFM) directly traces the surfaces of microscopic objects. This 1997 picture, taken by researchers at Oak Ridge (Tenn.) National Laboratory, shows the outline created by a loop of DNA (dark blue) placed on an ultrasmooth surface. The six peaks (red) are sites where a protein known as a restriction enzyme is bound to the DNA. The AFM image therefore locates the specific sequence to which the enzyme attaches.*



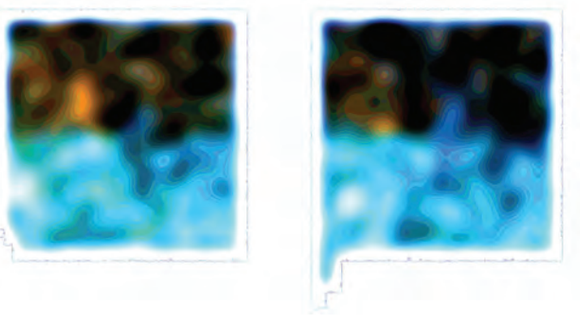
CRYSTAL POWER (*above and right*) *Some viewers may think that these striking photomicrographs of crystallized DNA are works of art. In fact, posters of them are available at* http://micro.magnet.fsu.edu/dna/index.html. *Yet there's a serious scientific side to the pictures. "We're looking at how DNA packages itself very tightly," says Michael Davidson of Florida State University in Tallahassee.*

Organisms need to stuff all their DNA into a small space. For example, the DNA in a single human cell would stretch out to about 6 feet. People solve this packing problem by tightly wrapping their DNA around proteins called histones. Viruses, bacteria, and other one-celled organisms don't have histones, however. In those cases, DNA bunches so densely that it achieves a liquid crystalline state, says Davidson. He and his colleagues duplicate those DNA densities in the laboratory. Although scientists typically study an organism's DNA in a watery solution, Davidson's team reduces the amount of water until the genetic material forms liquid crystalline phases called lyotropic phase transitions. The dramatic differences in the images stem from the crystalline phases being photographed and varying lighting conditions.



DAVIDSON/FSU; D.P. ALLISON, ET AL./GENOMICS, ELSEVIER; WONG ET AL./IEEE INC.

COLOR CUES (*right*) *Investigators are struggling to analyze the flood of DNA-base-sequence information that has accumulated in the past few years. The human genome sequence alone comprises some 3 billion base pairs. Some researchers are seeking ways to visualize this information. In work that will be reported in an upcoming* IEEE Transactions on Visualization and Computer Graphics, *Pak Chung Wong of Pacific Northwest National Laboratory in Richland, Wash., and his colleagues started with the known DNA-base sequences of two strains of the bacterium* Chlamydia trachomatics. *The researchers assigned each position in the sequence to a point on an image. They then gave each type of base a different color. After applying image-processing software to this information, the researchers created pictures in which genetic differences between the two bacterial strains are evident as color-pattern variations. Wong and his colleagues suggest that with this type of genome visualization, geneticists can more quickly identify subtle DNA differences between two similar organisms.*



WORDS GET IN THE WAY

Talk is cheap, but it can tax your memory

BY BRUCE BOWER

Law-enforcement officials typically solicit descriptions of criminals from eyewitnesses, often just after an offense has occurred. It stands to reason that thorough accounts by those who saw what happened will help investigators round up the likeliest suspects. Eyewitnesses can then pick the criminals out of a lineup. When crime-scene interviewing had its first brush with memory research in 1990, however, the results proved disturbing. A series of laboratory studies found that memories for a mock criminal's face were much poorer among eyewitnesses who had described what the perpetrator looked like shortly after seeing him, compared with those who hadn't.

Psychologist Jonathan W. Schooler of the University of Pittsburgh, who directed the studies, dubbed this effect "verbal overshadowing of visual memories." His paper's subtitle put it more bluntly: "Some things are better left unsaid."

Not among scientists, though. Discussion generated by Schooler's results ushered in a wave of research examining how eyewitnesses can find themselves, as he later quipped, "at a loss from words." Studies have confirmed that, at least under certain circumstances, verbal descriptions impair memories for faces and other hard-to-describe perceptions, such as the taste of a fine wine or the sound of a person's voice.

Recent investigations, described in the December 2002 *Applied Cognitive Psychology*, extend what's known about verbal overshadowing and offer potential tactics for counteracting this memory-sapping effect. However, no one yet knows the full range of perceptions subject to verbal overshadowing or its implications for various eyewitness-interviewing techniques.

"Verbal overshadowing is a genuine and reliable phenomenon," says psychologist Christian A. Meissner of Florida International University in Miami. "However, conclusions as to the mechanisms responsible for it appear [to be] complex and elusive."

MEMORY SHIFT Research into verbal-memory theft began with a staged felony. Schooler and a colleague showed volunteers a 30-second video depicting a man robbing a bank. Participants then spent 20 minutes on an unrelated task. At that point, a randomly chosen half of the group was asked to write a detailed description of the robber's face. These volunteers were encouraged to focus on each of the criminal's facial features and to use all of the allotted 5 minutes to jot down their memories. The rest spent 5 minutes tackling a second task unrelated to the video.

Each participant then tried to identify the robber's face from an array of eight photographs, only one of which showed the criminal impersonator. About one-third of those who wrote a description picked out the correct face, compared with two-thirds of those who didn't.

At first, Schooler suspected that errors in participants' verbal descriptions had altered the man's visual appearance in their mind's eye. This still-current theory holds that a person asked to describe a face inevitably makes errors in finding words for the ineffable quality of what another person looks like. Memory of the face then changes to accommodate the verbal depiction, which hinders the witness' later recognition of the face.

Schooler has since adopted a contrasting explanation, which posits that the act of describing a face replaces unconscious perceptual operations with word-based, largely conscious thinking. Ensuing attempts to identify the face visually refer back to the verbal account, creating confusion and mistakes. An accurate perceptual memory of the face theoretically remains intact, but people have trouble dipping back into that knowledge, Schooler proposes.

For instance, in a 1995 study, Schooler reported that verbal descriptions disrupted white volunteers' memories for the faces of white but not black individuals. He proposed that thanks to their extensive experience in looking at white faces, white volunteers used rapid, nonverbal perception to evaluate each such face as a unified entity. In contrast, volunteers spent more time studying individual features of the less-familiar black faces. Subsequent written descriptions were more consistent with the features that white participants remembered about the black faces than with the unified images they had stored for the white ones, Schooler concludes.

> "Eyewitnesses can find themselves at a loss from words."
>
> —JONATHAN W. SCHOOLER

Other research indicates that verbally adept individuals exhibit less memory loss after describing a same-race face than individuals with poor verbal skills do. Also, verbal overshadowing afflicts those with superior perceptual capabilities—such as skillful discernment of objects in cluttered scenes—to a greater extent than it does people with meager perceptual power.

Schooler is now exploring other perceptual capabilities that respond to verbal overshadowing. For instance, verbal descriptions impede one's mental map of an area, according to Schooler and his Pittsburgh colleague Stephen M. Fiore.

In their experiment, volunteers spent 12 minutes studying a map of a small town with a path connecting 16 landmarks, such as a library and a town hall. Half the test participants then wrote everything they could remember about the path's route and landmarks along the way. The rest took the time to write down some personal experiences unrelated to the map.

Only those who had described the map had difficulty estimating the relative straight-line distances between pairs of landmarks. Schooler says that these as-the-crow-flies estimates required each volunteer to consult a mental image of the entire town's layout, a form of perceptual knowledge that he regards as susceptible to verbal interference.

Verbal descriptions of the map didn't undermine recall of approximate lengths of winding paths between pairs of landmarks. This

task called for route knowledge that volunteers could verbalize, as in "go left at the library, then take the long, curving path to reach the schoolhouse," Schooler says.

SAVING FACE Other findings also suggest that a shift from a perceptual to a verbal focus blocks a person's access to perceptual memories, even though they remain intact.

In one study, conducted by Kim Finger of Claremont (Calif.) Graduate University, participants who wrote a description of a man's face after studying the face for 5 minutes suffered no memory loss if they were then nudged back into a perceptual frame of mind. To do this, Finger asked them either to solve a printed maze or to listen to 5 minutes of instrumental music. Both strategies yielded face memory equal to that of volunteers who didn't provide a written description.

Face recall also benefits from a delay of as few as 24 minutes between completing a verbal description and viewing a photo lineup, according to a study conducted by Finger and her Claremont colleague Kathy Pezdek. Such interruptions erased memory lapses that characterized volunteers tested 10 minutes after writing a description of a man's face.

Nearly half-hour breaks similarly refreshed the memories of people instructed to visualize the man's face, consider the thoughts and feelings they had while looking at his face, and report everything they could remember. Such tactics, now used by some police departments with crime witnesses (*SN: 4/19/97, p. 246*), yielded particularly poor face memories after 10-minute delays.

For now, police officers should show patience after interviewing people at crime scenes, Finger suggests. Before asking them to pore over mug shots, perhaps give eyewitnesses a few minutes to listen to recorded music, which may safeguard their memories.

WORDLESS RECALL — Eyewitnesses may remember a criminal's features more accurately if they don't immediately try to describe them.

Verbal descriptions can also interfere with "earwitness" memories, report psychologist Timothy J. Perfect of the University of Plymouth, England and his coworkers. In their study, volunteers heard a recorded voice say, "Just follow the instructions, don't press the alarm, and no one will get hurt." Compared with people who then sat quietly for 5 minutes, those given that same period to write down everything they could remember about the voice had far more difficulty identifying the same voice from among six choices.

"Verbal overshadowing is an amazing phenomenon," Pezdek says. However, she notes that it's failed to turn up in some studies.

DECEPTIVE DETAILS Meissner proposes an explanation for the sometimes elusive nature of verbal overshadowing. He bases his argument on a statistical analysis, conducted with John C. Brigham of Florida State University in Tallahassee, of 15 separate investigations of verbal overshadowing in facial memory that recruited a total of 2,018 people.

The pattern of results indicates that participants told to delineate every possible detail about a face, even to the point of guessing, litter their descriptions with blunders—especially if quizzed within 10 minutes of seeing the face, Meissner contends. They then try in vain to match their verbally retooled memories to what they see in a photo array or a lineup. This view contrasts with Schooler's idea that the original memory remains intact but inaccessible.

In a new study, Meissner explores the memory effects of different types of instructions given to 576 college students who studied a face for 5 seconds. One group was told to describe the face in detail and to disregard any uncertainties about their memories. Five minutes later, only about a third of these students selected the previously seen face from a photo array.

A second group of students was instructed to describe only what they could confidently remember, and after 5 minutes, slightly more than half recognized the face they had studied.

A third group was told to describe only what they could recall with certainty about the face and also was warned not to guess. They performed as well as study participants who weren't required to provide a description. About two-thirds of both groups chose the correct face.

These findings held whether volunteers tried to pick the previously seen face from an array of eight photos or viewed one photo at a time and gave a "yes" or "no" answer. Other studies, which have not controlled for the amount of detail in eyewitnesses' verbal descriptions, have generally concluded that one-at-a-time presentations of crime suspects yield more accurate recall than all-at-once inspections.

Moreover, in Meissner's work, the group told to report even uncertain details in their descriptions made far more false identifications than any other group when shown photo arrays that didn't include the original face.

SILENT MIGHT Meissner's findings underscore the narrow scope of verbal overshadowing, contends Florida State University psychologist K. Anders Ericsson. People forced to generate strictly limited verbal accounts can still remember a considerable amount of perceptual information, he says.

Ericsson and the late Herbert A. Simon developed a method, called protocol analysis, for interviewing individuals about their thought processes during and immediately after performing various tasks, such as mental arithmetic. Participants in these studies had been instructed to report orally only on what they can confidently recall and avoid making guesses.

Under these conditions, the act of reporting one's thoughts out loud either during or just after performing a mental task often leads to better memory for that task, when compared with silent recall of one's thoughts or the performance of irrelevant acts in the interim, Ericsson maintains.

Bare-bones interviewing practices, such as protocol analysis, avoid verbal overshadowing partly because the effect thrives on conscious deliberation about a prior act or perception, according to Schooler.

The types of problems that volunteers grapple with also make a difference, he says. For instance, Schooler has reported that people who described their thoughts as they solved "insight" problems—"Aha!"-type puzzles that require the discovery of subtle ways to conceptualize, say, an ambiguous picture or a word problem—had more difficulty solving the tasks than did people who said nothing. However, describing ongoing thoughts had no effect on people's success at solving analytical problems, such as mental arithmetic. In other words, articulating one's inner thoughts disrupts intuition but not logical analysis, in Schooler's view (*SN: 10/30/99, p. 282*).

Just as provocatively, research on verbal overshadowing challenges the popular notion among philosophers and psychologists that language lies at the core of thought. "Various forms of inexpressible knowledge may be best served by avoiding the application of language," Schooler says.

He adds that Albert Einstein would have agreed. "I very rarely think in words at all," the great scientist once told an interviewer. "A thought comes, and I may try to express it in words afterwards."

More often than the rest of us would like to admit, silence may indeed be golden. ■

OF NOTE

PHYSICS

Light rambles through room-temperature ruby

In experiments over the past 2 years, physicists have been slowing laser light to a crawl, sometimes even stopping it cold within certain frigid gasses and solids.

Now, researchers at the University of Rochester (N.Y.) have dramatically slowed light within a solid at room temperature—conditions considered vital for slow light to be harnessed for practical uses such as in optical-communication systems.

By firing a specially tuned green laser through a crimson, cigarette-size rod of artificial ruby, Rochester's Robert W. Boyd and his colleagues have decelerated light pulses to the 57-meter-per-second clip of an express train.

In previous light-slowing schemes (*SN: 2/9/02, p. 94*), scientists used two lasers to shuffle electrons in the medium among several energy states. The Rochester team's approach, reported in the March 21 *Physical Review Letters*, requires just two energy states and one laser, conditions that bode well for real-world applications, says team member Nick N. Lepeshkin. On the other hand, he notes, to handle the brief light pulses used in optical-communication systems, the team will have to find a substitute for ruby. —P.W.

BIOMEDICINE

Shots stop allergic reactions to venom

For some people living in Australia, jack jumper ants (*Myrmecia pilosula*) are no picnic. Nearly 3 percent of people in the state of Tasmania, for example, are allergic to the stings of these ants. Such reactions can be fatal if not treated promptly.

Scientists have now successfully tested a venom-based therapy against the allergy. It's the first so-called desensitization therapy to use ant venom, says Simon G.A. Brown of the Royal Hobart Hospital in Tasmania.

In desensitization therapy, a person receives injections of small amounts of an allergen. Physicians have used venom from bees and some other insects to desensitize people to those stings, but such therapy for ant stings has depended on extracts of whole ant bodies and has been only partially effective, says Brown.

He and his colleagues gave 20 or more injections of pure ant venom over several months to 23 healthy volunteers with the venom allergy, while 29 others with the same allergy received an inert substance. A week after the last shot, all the volunteers came back to the hospital where doctors allowed an ant to sting them twice.

Dangerous systemic allergic reactions, such as dropping blood pressure, occurred in 21 of the 29 people who had received the inert shots, whereas none of the 23 desensitized volunteers had a reaction, the scientists report in the March 22 *Lancet*.

The new study "is the first to show that effective immunotherapy can be provided for ant-sting allergy," says Brown. —N.S.

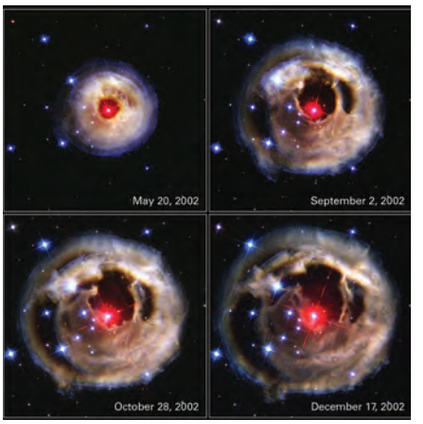
ASTRONOMY

Echoes of a stellar outburst

Like a flashbulb illuminating fog, light from the outburst of a star has revealed its dusty surroundings. The light bouncing off the dust, which astronomers call a light echo, hasn't been observed in our galaxy since 1936. The new echo has been captured in exquisite detail by the Hubble Space Telescope, reports Howard Bond of the Space Telescope Science Institute in Baltimore and his colleagues in the March 27 *Nature*.

The echo not only reveals the dusty netherworld, but also provides a record of the star's unusual eruption, Bond notes. During the outburst, which astronomers observed in January 2002, the star inflated to a diameter at least 800 times larger than that of the sun and briefly became the most luminous star in the Milky Way.

Although the body, known as V838 Monocerotis, has since faded, the light from the outburst continues to reflect off surrounding dust. As light bouncing off dust farther and farther from the star reaches Earth, the circular reflections provide an expanding cross-section of the star's envelope of dust. The light-echo has now expanded to twice the size of Jupiter, as seen from Earth, and may be visible until about 2010. The Hubble images reveal that the star is 20,000 light-years from Earth. —R.C.



DUSTY SPOTLIGHT Sequence of images shows light from a stellar flash spreading into space and reflecting off more and more distant layers of dust surrounding the star.

NASA, ESA AND BOND (STSCI)

PHYSICS

Fusion device crosses threshold

By sparking thermonuclear reactions, a machine simply called Z has joined the big leagues among potential technologies for producing power from controlled nuclear fusion.

Thermonuclear fusion takes place when matter becomes so hot that violent collisions force atomic nuclei to fuse together. Those reactions unleash a flood of energetic neutrons.

Until now, the only other fusion-energy approaches that achieved thermonuclear-fusion reactions in a lab are one in which huge lasers blast tiny, hydrogen-filled capsules and another in which hulking reactors use potent magnetic fields to squeeze hot, ionized hydrogen gas.

Here's how Z goes thermonuclear: About the size of a hockey rink, the machine pumps 19 million amperes of electric current through a bracelet–size, cylindrical array of tungsten wires within about 100-billionths of a second. The wire cage vaporizes, collapsing inward and radiating X-rays toward a sesame-seed-size capsule of heavy hydrogen. This heats and squeezes the hydrogen until some of it fuses into helium and tritium nuclei.

Four years ago, temperatures at Z had already topped 2 million degrees, enough for thermonuclear fusion (*SN: 1/23/99, p. 63*). Yet both the machine and the hydrogen capsule needed further tweaking, says Thomas A. Mehlhorn, a Z project leader at Sandia National Laboratories in Albuquerque, N.M., where the fusion device is located.

Now the temperature in Z soars past 10 million degrees, and each blast, called a Z-pinch, yields some 10 billion neutrons, Sandia researchers reported April 6 at a meeting of the American Physical Society in Philadelphia. With numbers like that, "we're now credible," Mehlhorn says. —P.W.

VACCINE SAFETY

Vaccine didn't cause heart deaths

Fatal heart attacks that recently struck two people after they were vaccinated against smallpox were probably unfortunate coincidences, not adverse consequences of vaccination, say epidemiologists who base their conclusion on death records from the 1940s.

More than 6 million New York City residents were vaccinated against smallpox in April 1947 after a man who'd returned from Mexico died from the infection, Lorna Thorpe of the Centers for Disease Control and Prevention (CDC) and her colleagues at the New York City health department combed through more than 80,000 death certificates from the period shortly after the city's vaccination drive. The researchers found no spike in mortality from heart attacks.

"We feel reassured by the data that in 1947 there was not a significant increase in cardiovascular risk" associated with the vaccine, says Thorpe.

The two recent deaths raised concerns that the vaccine, already known to have significant risks (*SN: 4/5/03, p. 218*), might have previously unidentified cardiac side effects. As a precaution, the government has warned people with certain heart conditions not to get the shot. For the moment, the precaution remains in place. —B.H.

EMERGING INFECTIONS

Africa faces new meningitis threat

A previously rare, vaccine-resistant strain of a deadly bacterium caused an epidemic of meningitis last year in western Africa and seems to have spread around the world, researchers report.

Three years ago, people from more than a dozen countries in Africa, Asia, Europe, and North America became infected with the W-135 strain of *Neisseria meningitidis* after Muslim pilgrims unknowingly carried it home from the annual Hajj in Mecca, Saudi Arabia.

Seasonal outbreaks of other strains of *N. meningitidis* often strike Africa's so-called meningitis belt, which stretches from Senegal to Ethiopia. Anticipating that W-135 might cause an outbreak, Joshua Jones of the CDC in Atlanta and his colleagues closely monitored three meningitis-belt nations for 6 months last year. Sure enough, they detected an outbreak of the rare strain as it moved through Burkina Faso.

MEETINGS

CDC Epidemic Intelligence Service
Atlanta, Ga.
March 31 – April 4

A relatively inexpensive vaccine can stop outbreaks of the two most common strains of *N. meningitidis*. The emerging strain, which can be blocked only by a much pricier vaccine, could hamper meningitis-control efforts in Africa, says Jones. Public health officials are now working with vaccine manufacturers to develop a cheaper vaccine that's effective against W-135. —B.H.

BIOMEDICINE

Transfusions and transplants spread West Nile virus

Donated blood and organs should be screened to prevent transmission of West Nile virus, federal officials say. In addition to bites from infected mosquitoes, which is the most common route of infection in both people and animals, blood and transplanted organs can also spread the virus, two recent investigations indicate.

West Nile virus transmission has also been linked to breast-feeding, but children are less likely than older adults to get sick from the virus (*http://sciencenews.org/20021019/food.asp*).

Last year, the United States experienced an unprecedented 3,389 cases of human illness attributed to West Nile virus. They began on June 10 and lasted into November. In August, four people in two states became infected after receiving transplanted organs from the same donor. One of the four died.

The organ donor was infected with West Nile virus through a blood transfusion shortly before dying from an injury, Martha Iwamoto and her colleagues at CDC in Atlanta determined.

They reached this conclusion after applying two tests for West Nile virus to tissue samples from the organ donor. Tissues collected just after the donor was injured were negative for the virus, but one taken later tested positive. In the interim, the patient had received units of blood from dozens of donors.

A separate investigation identified at least 21 people nationwide who developed West Nile infections after receiving blood from infected donors. Twelve of the 21 developed West Nile meningoencephalitis, the inflammation that's the most serious form of illness associated with the virus. Six of them died.

The donors hadn't been diagnosed with West Nile disease when they donated blood, but they later tested positive for the virus, reports Lisa N. Pealer of CDC.

To prevent infections in the future, researchers have developed tests to identify West Nile virus in donated blood and organs for transplantation. The U.S. government could approve the tests for routine screening of blood and organs as soon as this year.

West Nile virus doesn't cause noticeable illness in most people, but a fraction of infected people develop fever or meningoencephalitis, and about 6 percent of those who fall ill die. —B.H.

INFECTIOUS DISEASES

Body wraps caused rash of rashes

A CDC investigator has linked an outbreak of skin infections to unsanitary practices at a body-wrap salon. The spa, as others do, has customers exercise while tightly swathed in wet elastic bandages.

Alicia Cronquist, assigned by CDC to the Colorado Department of Public Health and Environment in Denver, began her investigation after the owner of a Colorado salon developed a rash of pustules caused by *Pseudomonas aeruginosa* in February 2002. These bacteria flourish in warm, wet conditions, the very ones that characterize body wraps. With the salon owner's help, Cronquist identified and contacted recent clients. Nine had developed skin pustules like the owner's.

CRONQUIST

INFECTION BOUND
Body wraps like this one can spread skin infections.

At the salon, Cronquist and her health-department colleagues found *P. aeruginosa* on bandages and in unrefrigerated bottles of the solution for soaking bandages.

To reduce the likelihood of outbreaks, Cronquist recommends that wrap salons use bandages only once or launder them in hot water and soap. The salon's contract with its franchiser stipulates that it reuse bandages after washing them in cold water and grapefruit-seed extract.

Cronquist also recommends that salons refrigerate open bottles of solutions used in body wraps or discard them at the end of each day. She has asked the Food and Drug Administration to examine the need to regulate body-wrap products. —B.H.

Cognitive Neuroscience Society
New York City
March 30 – April 1

MEMORY

Gestures help words become memorable

Hand gestures amplify the impact of spoken words, rather than serving merely as embellishment for speech, say Emily S. Cross and Elizabeth A. Franz, both of the University of Otago in Dunedin, New Zealand. People recall more of what they hear if the speaker communicates with relevant hand gestures, the researchers find.

Cross and Franz studied 120 college students. Each volunteer viewed three blocks of 27 video clips of a woman saying phrases such as "peel the banana" or "the square box." In each block of clips, the speaker used gestures that paralleled phrase content, irrelevant gestures, or no gestures. Listeners named as many phrases as they could recall after each block.

Participants remembered a majority of phrases spoken with relevant gestures. Recall slumped substantially for gesture-free phrases and was even worse for phrases accompanied by irrelevant gestures. Students who themselves frequently use gestures as they speak remembered fewer irrelevant-gesture phrases than did those who rarely add gestures to their speech. —B.B.

NEUROBIOLOGY

Left brain hammers out tool use

Pounding nails with a hammer, sawing wood, and wielding other familiar tools are feats coordinated by the brain's left hemisphere, new studies suggest.

"The left hemisphere may maintain knowledge about how to use objects that serve as extensions of our bodies," says Scott H. Johnson-Frey of Dartmouth College in Hanover, N.H.

Johnson-Frey and his coworkers first studied 12 adults with healthy brains. A so-called functional magnetic resonance imaging scanner measured neural blood-flow changes—an indirect marker of brain-cell activity—as each volunteer first pantomimed using a hammer and other common tools and then made random hand movements.

The scans revealed increases in brain-cell activity unique to tool use only in parts of the left hemisphere, near the front and toward the back of the brain. These results held whether the right-handed participants pantomimed with their right or left hands.

The left-brain association with tool use was strengthened by studies of two people who previously had the nerve fibers connecting their left and right hemispheres surgically severed to control severe epilepsy. In these split-brain individuals (*SN: 2/24/96, p. 124*), the right hemisphere controls the body's left side and handles information flashed in the left visual field, while the left hemisphere runs right-sided affairs. One patient was right-handed and the other was left-handed.

After seeing pictures of tools flashed on the right for left-brain inspection, both patients accurately demonstrated how to use the implements. After seeing pictures flashed on the left for right-brain scrutiny, however, their portrayals became confused and inappropriate.

The new findings add to prior observations of tool-use difficulties in people with various types of left-brain damage. —B.B.

Books

A selection of new and notable books of scientific interest

FASTER THAN THE SPEED OF LIGHT: The Story of a Scientific Speculation

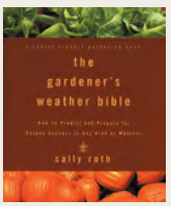
JOÃO MAGUEIJO

In his general theory of relativity, Albert Einstein postulated that light travels at one speed only, a concept that physicists almost universally have accepted. Magueijo, a professor of theoretical physics at Imperial College in London, boldly challenges this notion and thus the entire physics community. The author puts forth the idea that the speed of light is not constant and that light traveled faster in the early universe than it does today. Dubbed the varying speed of light theory (VSL), this concept could lead to a universal theory that explains everything from space travel to string theory, Magueijo asserts. He makes his case while clearly spelling out both VSL and relativity. In the process of detailing the science behind his ideas, the author also decries his opponents and shares his travails in getting his controversial theory before his peers and the public. ***Perseus Pubng, 2003, 279 p., b&w photos/illus., hardcover, $26.00.***

THE GARDENER'S WEATHER BIBLE: How to Predict and Prepare for Garden Success in Any Kind of Weather

SALLY ROTH

Roth embraces the rain. So much so, she writes, that she's in her garden at the first drop, busily transplanting, weeding, and sowing new seeds. That way, she takes advantage of the moist soil and air and avoids the sunlight that stresses the plants she's disturbing. Roth examines how to deal with any type of weather—day or night—as a gardener. For instance, she explains how to protect plants from the wind and when to take action against frost. After a brief chapter on the basics of meteorology, mixed with a little forecasting folklore, she explains how to use weather to the advantage of your garden. ***Rodale Pr Inc., 2003, 305 p., color illus., paperback, $21.95.***



OUR COSMIC HABITAT

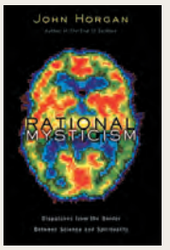
MARTIN REES

Albert Einstein once asked, "Could God have made the world any differently?" Renowned theoretical astrophysicist Rees answers that question, "Yes." As he did in a series of lectures at Princeton University, Rees argues here on behalf of the multiverse concept. According to Rees, this theory places our universe among many, making it no more than "one small element, or atom, in an infinite and immensely varied ensemble." While other universes may harbor life, ours is a "fertile oasis" within this multiverse because of the laws of physics, he believes. He surveys the cutting edge of such theorizing and imparts the latest relevant scientific results in crystal-clear prose. As he goes, he considers some of the questions that challenge him and his colleagues: Is our universe infinite or finite? How credible is the Big Bang theory? How could the universe, 10 billion light-years in all directions, have been formed from an infinitesimal speck? And he provides some theoretical answers. Originally published in hardcover in 2001. ***Princeton U Pr, 2003, 205 p., b&w illus., paperback, $14.95.***

RATIONAL MYSTICISM: Dispatches from the Border Between Science and Spirituality

JOHN HORGAN

In his 1997 book *The End of Science*, Horgan briefly considered whether mystical experiences might yield insights that could transcend what we can learn through objective investigation. Although he feared that this topic might put off scientists, he found just the opposite after the book came out. The response led him to think about how to reconcile mystical intuition with reason. It turns out that there's a host of scientists following this line of inquiry, especially those studying consciousness. At the University of Pennsylvania, for example, researchers are trying to pinpoint the neural correlates of mystical experience by scanning the brains of people while they meditate or pray. Horgan interviews neuroscientists, as well as scores of theologians, philosophers, and psychiatrists, and challenges them to explain their theories about spirituality. ***HM, 2003, 292 p., hardcover, $25.00.***



THE X IN SEX: How the X Chromosome Controls Our Lives

DAVID BAINBRIDGE

Up until the sixth week after conception, all embryos are sexually the same. How then do we become male or female? The answer lies in the X and Y chromosomes, with males getting one of each and females getting two Xs. Bainbridge asks why women and men look, think, and act so differently from each other. After all, extreme differences in these areas wouldn't seem to be necessary for the sake of reproduction. In his quest to understand the biology of all this, Bainbridge traces the history of the X chromosome and considers its influence on differences between the sexes. He also explores the other roles of the X chromosome, such as in influencing a person's sexuality and carrying genes that mark several diseases. Most men with hemophilia, for instance, have a damaged X chromosome. Women can carry a damaged X chromosome, but if they have a healthy X, it sometimes makes up for the bad one. Advances in genetics and DNA sequencing have provided a wealth of data for Bainbridge to elaborate on in this book. ***HUP, 2003, 205 p., hardcover, $22.95.***

HOW TO ORDER To order these books, please contact your favorite book store. *Science News* regrets that it can no longer colloborate with How To Media to provide books by mail.

LETTERS

Fat chance

"Dietary Dilemmas" (*SN: 2/8/03, p. 88*) makes disturbing use of Neal Barnard as a spokesman warning against the high-protein weight-loss diet. Barnard represents Physicians Committee For Responsible Medicine (PCRM). What's not to love about an outfit with a name like that? PCRM places op-ed pieces condemning animal products, and it advocates a vegan agenda. A more balanced response might have suggested increasing calcium rather than limiting protein to avoid demineralization of bones.

JOANN S. GROHMAN, DIXFIELD, MAINE

Americans overweight? In our experience, no balancing of fats, carbs, and proteins will overcome the simple mathematics of overeating and not exercising. During our 20 years in the wilderness-lodge business in Alaska, we estimate that the amount of food our clients load onto their plates has increased by roughly 30 percent. We have found over the years that we increasingly have to take obesity into account on every activity we guide.

JACK HAYDEN, DENALI WEST LODGE, LAKE MINCHUMINA, ALASKA

New and improved

"Synthetic molecule may treat anemia" (*SN: 2/15/03, p. 109*) reports that chemically synthesized erythropoiesis protein (SEP) was more effective than the genetically engineered molecule. Is there speculation on why that is?

ANN DERSHOWITZ, WEST ORANGE, N.J.

Chemically constructed SEP molecules are much more consistent in size, shape, and other properties than genetically engineered erythropoietin. The polymer appendages put onto the molecule protect SEP and thus increase its lifetime, which also leads to higher activity. —J. GORMAN

Take dot

I am puzzled by Shuming Nie's prognostication that quantum dots will "be the first example of nanotechnology that can really have some practical applications" ("Nanolights! Camera! Action!" *SN: 2/15/03, p. 107*). Colloidal gold particles of similar size to quantum dots have been used as high-resolution labels in electron microscopy for over 30 years. And due to their light-scattering properties, gold and silver nanoparticles have been used in stained glass since at least the 17th century!

DARYL A. MEYER, MADISON, WIS.