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ScienceNews

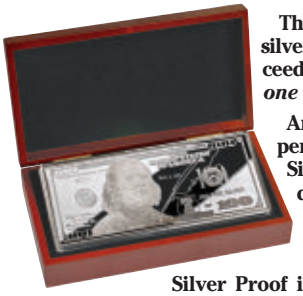
MAGAZINE OF THE SOCIETY FOR SCIENCE & THE PUBLIC ■ MARCH 24, 2012

Limited Mintage Striking...

WORLD'S FIRST $100 SILVER PROOF

First-year 2012 date | Mirrored proof background | Larger Franklin portrait | Liberty Bell, quill pen & July 4th date | Minted in one Troy ounce of pure silver bullion | Shown larger than actual size of 6" x 2½"

New York Mint Announces the Limited Mintage Striking of an Extraordinary Silver Proof —the New United States $100 Bill Struck in Pure Silver Bullion. Discount Price $99



This extraordinary piece of pure silver bullion has a surface area that exceeds 30 square inches...and it contains *one Troy ounce of pure silver bullion*!

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ADVANCE STRIKE DISCOUNT

The price for the 2012 One-Ounce Silver Proof will be set at $129 per proof.

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MARCH 24, 2012 • VOL. 181 • NO. 6

ScienceNews

In The News

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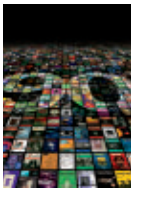

COVER Since its launch in 1922 (as *Science News-Letter*), more than 4,000 covers of *Science News* have presented images of science in action. *Jim Webb*

ScienceNews
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FROM THE EDITOR

After 90 years of effort, the job remains undone

Achieving nonagenarian status is an admirable accomplishment for anybody, regardless of other achievements or lack thereof during those nine decades. But *Science News* has plenty of accomplishments to celebrate on the occasion of its 90th birthday.

Since mimeographed sheets of science news articles were first distributed as the *Science News-Letter* in March 1922, our writers and editors have been embedded in the scientific process. We've recounted great steps in science's progress and the impact of technological snafus and natural disasters. Our pages have recorded the arrival of antibiotics, the discovery of antimatter, the surprise of nuclear fission and the atomic bomb. Satellites, space probes and lunar landings. DNA, gene-splicing, genome sequencing and cloning. Three Mile Island, the 1984 chemical catastrophe at Bhopal and the Japanese earthquake/tsunami/nuclear fiasco of 2011.

Throughout all these years, the purpose of *Science News* has remained the same: to tell everyone who is interested what scientists are finding out about the world. And to put those findings and their implications into a context that makes their significance to society clear. As articulated by E.W. Scripps, the journalist who was instrumental in founding the organization that publishes *Science News*, the institution's objective should be "to present facts in readable and interesting form" — not for the purpose of promoting any particular cause, but to provide readers facts upon which they could base their own opinions.

For the special anniversary section in this issue (Page 20), Senior Editor Janet Raloff (who has been around for nearly 40 percent of the magazine's existence) pored over the *Science News* corpus to identify the most noteworthy facts that we have presented to the public in interesting and readable form.

Space constraints allowed highlighting just a few of the many gems in our archival mine. But they are exemplary samples of the wealth of science that the last nine decades has witnessed, and of science's impact on human civilization and individual people. These reminiscences offer a reminder of how essential science is to the fabric of modern life. And they illustrate one unchanging truth about science: It is never static. News from science today continues to flow as swiftly as ever, and helping people keep up with it all is no less important now than it was 90 years ago. It's a task that society will need somebody to do for a long time to come, no doubt even longer than another 90 years. —*Tom Siegfried, Editor in Chief*

JIM WEBB

Technology Breakthrough Safe, comfortable bathing from Jacuzzi®

Enjoy A Bath Again… Safely and Affordably

The Designed for Seniors™ Walk-In tub is luxurious, feature-packed and affordable

There is nothing like the simple pleasure of taking a warm bath. The cares of the day seem to fade away, along with the aches and pains of everyday life. Unfortunately for many aging Americans with mobility issues, slipping into a bath can result in slipping onto the floor. The fear of falling has made the simple act of bathing and its therapeutic benefits a thing of the past… until now. *first*STREET, the leader in products *Designed for Seniors*™ has partnered with Jacuzzi®, the company that perfected hydrotherapy. Together, they've created a walk-in tub that offers more than just safe bathing, peace-of-mind and independence, it can actually help you feel better.

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- **Comfort** - Insist on ergonomic design, easy-to-reach controls.
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Say What?

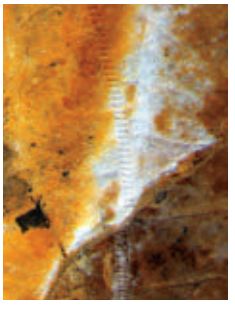
Alvinocaridid ***al-vin-oh-CEHY-ri-did***\ ***n.*** A type of shrimp found at deep-sea hydrothermal vents, including a species (right) described in the Jan. 10 *Nature Communications* as living in the Cayman Trough in the Caribbean. The shrimp are so named because they resemble *Alvinocaris*, a genus found in the late 1970s at the world's first known hydrothermal vents, in the Galápagos Rift in the eastern Pacific Ocean. *Alvinocaris*, in turn, got its name from the deep-diving submersible Alvin, which explored such unknown worlds. Alvinocaridids don't have full-fledged eyes, but some can navigate using a light-sensing organ to detect volcanic energy pouring from the seafloor. —*Alexandra Witze*

Science Past | FROM THE ISSUE OF MARCH 24, 1962

ANTI-PARTICLE DISCOVERED — Three international teams of scientists, working in the United States, Switzerland and France, have discovered and identified one of the last predicted anti-particles of matter, the anti-Xi-minus. Also known as the anti-cascade-hyperon, the tiny particle of anti-matter exists only for one ten-billionth of a second. Nevertheless, it has been observed, measured and photographed, the scientists report in *Physical Review Letters*, March 15, 1962. The discovery confirms the theory that there is an anti-particle for every known elementary particle.... The anti-Xi-minus is the heaviest of the predicted elementary particles to be observed. It has a positive charge.

The (-est)

Scientists have re-created what may be the oldest love song ever heard by human ears: the chirp made by a 165-million-year-old katydid rubbing its wings together. "It sounded a lot like a modern-day cricket," says biologist Fernando Montealegre-Zapata of the University of Bristol in England. He and his colleagues based their reconstruction on an exceptionally preserved katydid fossil, as reported online February 6 in the *Proceedings of the National Academy of Sciences*. The pure tones of the extinct insect's nocturnes may have carried long distances through noisy Jurassic forests, says Montealegre-Zapata, and could have identified the creature as a potential mate — or a potential meal. —*Devin Powell*



Science Future

April 4
Artists and scientists come together at the Leonardo Art/Science Evening Rendezvous at Stanford University. See bit.ly/SNartnite

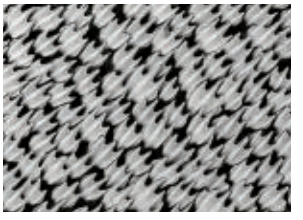
April 13–29
Science talks, lab tours and hands-on activities will be held statewide as part of the North Carolina Science Festival. For a schedule of events, go to www.ncsciencefestival.org

SN Online

www.sciencenews.org

LIFE
Plants use adhesion and bubbles to spread spores. See "Plants' reproductive weaponry unfurled."

Sharp scales (shown) help propel sharks. See "Shark's skin adds forward boost."



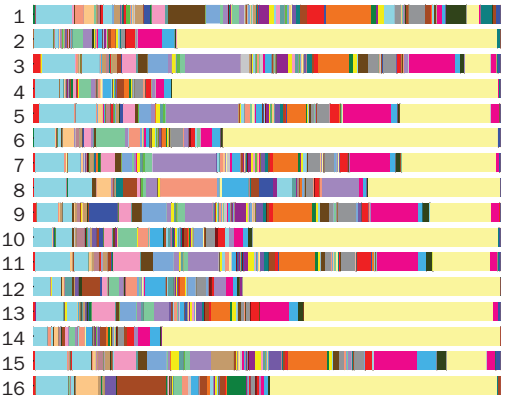
MOLECULES
The sugar in corn syrup may be a concern for diabetics. Read "Taste of fructose revs up metabolism."

DELETED SCENES BLOG
Measurements of the W boson hint at the mass of its more famous cousin. See "Higgs running out of hiding places."

Science Stats | GERMS YOU CARRY AROUND

Like uptowners and downtowners, different bacterial communities hang out on your cell phone and your shoes. Scientists from the Home Microbiome Study swabbed the shoe soles and phones of about 30 reporters (including one from *Science News*) in February at the AAAS meeting in Vancouver. The researchers found similar bacterial profiles across reporters, including two types normally found in the throat that appeared to prefer cell phones. SOURCE: HOME MICROBIOME STUDY

Bacterial species on reporters' phones and shoes



CLOCKWISE FROM TOP: NOC/UNIV. OF SOUTHAMPTON; J. OEFFNER AND G.V. LAUDER/HARVARD UNIV.; J.J. GU *ET AL./PNAS* 2012

“We’ve found these prions in hundreds of strains and they are conferring all kinds of really interesting biology to the cells.”
— SUSAN LINDQUIST, PAGE 14

In the News

STORY ONE

Genome paints a better portrait of the Iceman

DNA reveals Ötzi had Lyme disease, lactose intolerance

By Tina Hesman Saey

By peering deeply into the DNA of the mummy known as Ötzi, geneticists have expanded the profile of the 5,300-year-old Iceman: He had brown eyes, brown hair and blood type O, was lactose intolerant and his modern-day relatives live on Corsica and Sardinia.

These vital statistics come from an analysis of the Tyrolean man’s complete genetic blueprint, reported online February 28 in *Nature Communications*. The DNA analysis also reveals that the Iceman, found frozen and well-preserved in the Italian Alps in 1991, carried genetic risk factors for heart disease. And he was infected with the bacterium that causes Lyme disease, making him the oldest known case of the disorder.

For the new study, researchers led by Albert Zink, an anthropologist at the European Academy of Bolzano in Italy, removed a bit of Ötzi’s hip bone and extracted DNA from the sample. The mummy’s fresh-frozen state helped preserve his DNA, making deciphering a complete genetic blueprint easier than for most ancient samples, says Niels Lynnerup, a forensic anthropologist at the University of Copenhagen. “It is much better DNA than you can get from one dry old bone,” he says.

MARCO SAMADELLI/EURAC

Researchers Eduard Egarter-Vigl (left) and Albert Zink take a small piece of the Iceman’s hip bone in November 2010. DNA extracted from the bone was used to compile a complete genetic profile of the man, who lived in the southern Alps about 5,300 years ago.

Ötzi’s brown eyes and lactose intolerance are evidence that scientists are right about the pace of evolution of some human traits, says John Hawks, an anthropologist at the University of Wisconsin–Madison. Mutations that gave rise to genes for blue eyes and the ability to digest dairy products into adulthood arose sometime within the last 10,000 years but took many, many generations to spread throughout Europe. (Most evidence suggests the lactose tolerance gene was widespread in Europeans by the Middle Ages.)

People living in Ötzi’s time “had the dairy animals, but what they didn’t have was enough generations for the gene to become common,” Hawks says. The finding that the Iceman was lactose intolerant supports that picture. “We were right about this gene. It is new.”

Previous studies of Ötzi’s genetic past examined DNA only from cells’ energy-making factories, called mitochondria. People inherit mitochondria from their mothers, and mitochondrial DNA can be used to trace a person’s maternal lineage. Ötzi’s mitochondria carry some genetic variants not seen in modern Europeans, leading scientists to think that his maternal line has died out.

In the new study, researchers examined all of the Iceman’s DNA, including his Y chromosome. Since Y chromosomes are passed from father to son,

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SN Today at **www.sciencenews.org**

certain molecular signatures there can help identify relatives from the father's side of the family. Ötzi's Y chromosome contains genetic variants that are rare in Europe today, and found mainly in people who live on the islands of Corsica and Sardinia.

A decade ago scientists might have concluded that this shared DNA meant that Ötzi's people migrated from the Alps and settled on the Mediterranean islands, Hawks says. But now most think that Corsicans and Sardinians probably aren't direct descendants of the Iceman's people, but simply bear genetic signatures common throughout Europe in Ötzi's day.

The Iceman may well be related to present-day people from the southern Alps where he lived and died, Zink says. Scientists don't have DNA samples from many people in the Tyrolean Alps with which to compare Ötzi's DNA, leaving open the possibility that researchers may yet discover other modern-day relatives.

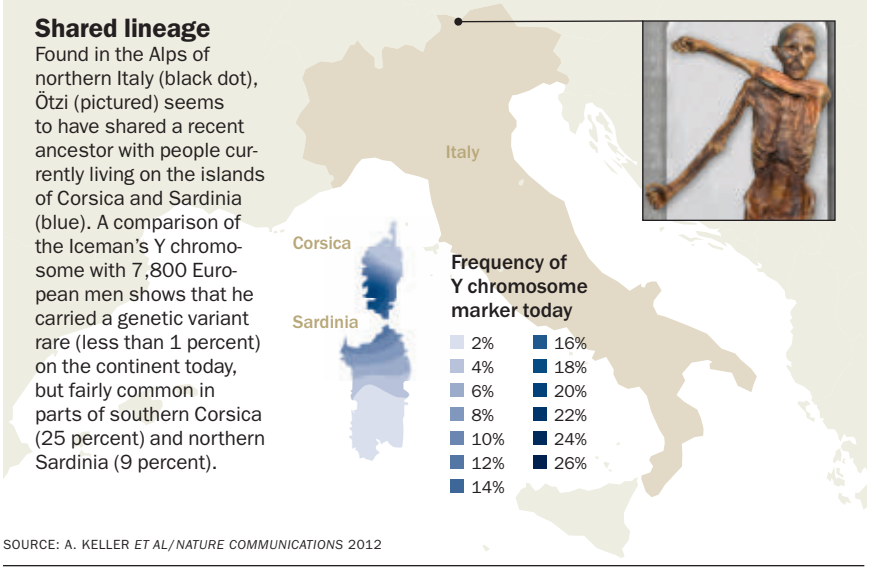
Modern humans first entered Europe some time around 45,000 years ago. But, says Hawks, "Europeans have changed since then." Ötzi's people were probably part of a wave of farmers from the Near East that settled throughout Europe in the Neolithic period. Those people were genetically distinct from those who lived in Europe before, and also from people who later came to the continent. "We don't know how many waves there were or how much they mixed," Hawks says.

Although the Iceman's Y chromosome is most similar to people living on Corsica and Sardinia, "I expect that relatives of the rest of his genome are scattered all over Europe," Hawks says.

Ötzi is the most ancient person ever diagnosed with Lyme disease, an infection caused by the bacterium *Borrelia burgdorferi*. Researchers have known that the bacterium has infected animals for millions of years and thought that ancient humans probably contracted the illness as well.

"It has been a theory that it goes back many, many thousands of years, but we've not had proof before," says Allen Steere, a physician and scientist at Harvard Medical School in Boston who first discovered and named Lyme disease. "This is proof that it goes back at least 5,000 years, and probably a long time before that." ■

Shared lineage
Found in the Alps of northern Italy (black dot), Ötzi (pictured) seems to have shared a recent ancestor with people currently living on the islands of Corsica and Sardinia (blue). A comparison of the Iceman's Y chromosome with 7,800 European men shows that he carried a genetic variant rare (less than 1 percent) on the continent today, but fairly common in parts of southern Corsica (25 percent) and northern Sardinia (9 percent).



SOURCE: A. KELLER *ET AL/NATURE COMMUNICATIONS* 2012

FROM TOP: SOUTH TYROL MUSEUM OF ARCHAEOLOGY, MARCO SAMADELLI AND GREGOR STASCHITZ/EURAC; KENNIS, COURTESY OF SOUTH TYROL MUSEUM OF ARCHAEOLOGY

Back Story | ICEMAN'S VITAL STATS

Studies of Ötzi's frozen remains have revealed a trove of information about his life and death 5,300 years ago, including a re-creation of what he looked like, left.

Nickname: Ötzi

Sex: Male

Height: 5'3"

Weight: 110 pounds

Eyes: Brown

Hair: Brown

Age: About 46

Hometown: Ötzi's equipment, the pollen grains in his stomach and the chemical composition of his teeth and bones suggest that the Iceman grew up in the Eisack Valley of the Italian Alps. He spent at least the last 10 years of his life in the Vinschgau Valley.

Diet: Analysis of his stomach and intestines show he ate wild cereals, the wild goat called ibex, some flowering plants and red deer. His last meal was a heaping helping of wild goat eaten within an hour of his death.

Job: The evidence isn't clear on Ötzi's occupation, but scientists have proposed that he may have been a shaman, mineral prospector, hunter, warrior or shepherd.

Health: Scans and other studies reveal hardened arteries, gallstones, arthritic knees (possibly related to Lyme disease), intestinal parasites called whipworms and fleas.

Death: The Iceman was in hand-to-hand combat shortly before he died. He bled to death after being hit in the back with an arrow.

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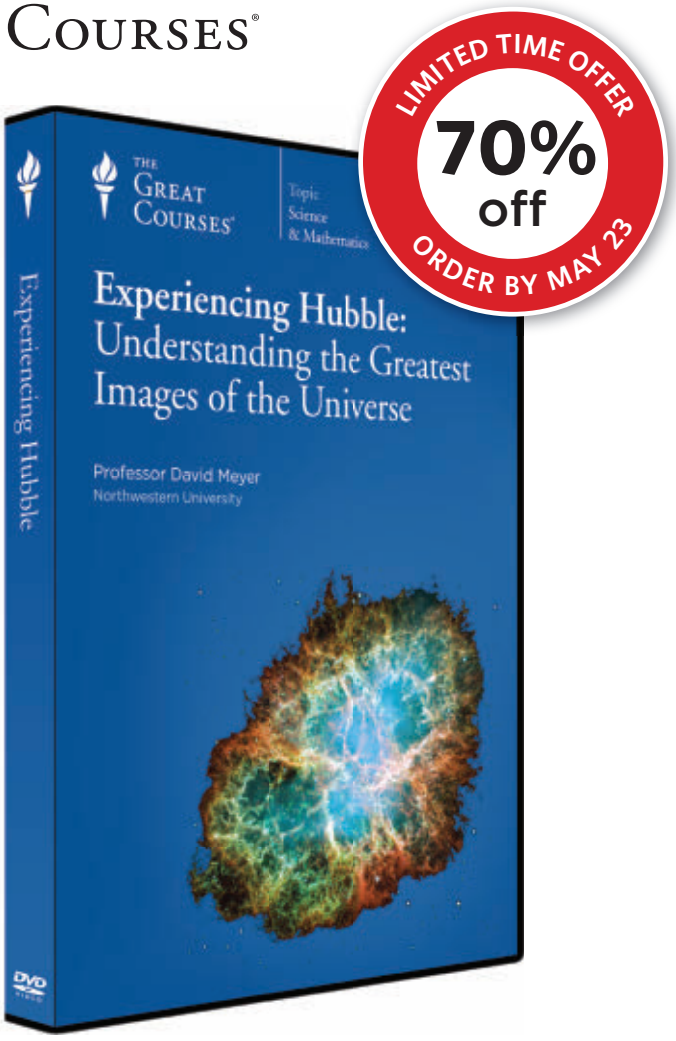

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Atom & Cosmos

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Crystals in time may be possible

Theory says objects can loop forever in fourth dimension

By Alexandra Witze

What sounds like the title of a bad fantasy movie — time crystals — could be the next big thing in theoretical physics.

In two new papers, Nobel Prize–winning physicist Frank Wilczek lays out the mathematics of how an object moving in its lowest energy state could experience a sort of structure in time. Such a "time crystal" would be the temporal equivalent of an everyday crystal, in which atoms occupy positions that repeat periodically in space.

The work, done partly with University of Kentucky physicist Alfred Shapere, appeared February 12 on arXiv.org.

"We don't know whether such things do exist in nature, but the surprise is that they can exist," says physicist Maulik Parikh of Arizona State University.

Scientists can't predict how important time crystals may turn out to be, or whether they have any practical application. But Wilczek, of MIT, says the concept reminds him of the excitement he felt when he helped describe a new class of fundamental particles, called anyons, in the early 1980s. "I had very much the same kind of feeling as I'm having here," he says, "that I had found a new logical possibility for how matter might behave that opened up a new world with many possible directions."

Wilczek dreamed up time crystals after teaching a class about classifying crystals in three dimensions and wondering why that structure couldn't extend to the fourth dimension — time.

To visualize a time crystal, think of Earth looping back to its same location in space every 365¼ days; the planet repeats itself periodically as it moves through time. But a true time crystal is made not of a planet but of an object in its lowest energy state, like an electron stripped of all possible energy.

In a sense the time crystal would be a perpetual motion machine: If scientists could build one in a lab, it would run forever. Yet it wouldn't violate the second law of thermodynamics because the crystal would be in its lowest energy state; no useful energy could be extracted from it.

Wilczek is already thinking of extending the time crystal concept into imaginary time, a theoretical concept of the fourth dimension that runs in a different direction than the one people experience.

"I don't know if this will be of lasting value at all," he says, "but I'm having fun."

Editor's Note: Wilczek is a member of the board of Society for Science & the Public, which publishes Science News.

Lunar lights made by molten blobs

Mysterious moon flashes sparked by minimeteorite impacts

By Nadia Drake

Meteorites colliding with the moon sometimes set off tiny lights dancing across its surface. Now scientists think they know what powers these lunar lightbulbs, in the absence of any atmosphere that would otherwise set incoming meteors ablaze: The flashes result from superhot material released as tiny rocky objects strike the moon's surface.

"You have just a small piece of cometary material or asteroid, about 10 centimeters, that can do a very bright flash visible from the Earth," says study coauthor Sylvain Bouley, a planetary scientist at the Paris Observatory.

Bouley and colleagues settle an old debate about where the twinkling lunar lights come from in the March *Icarus*. Observed for more than half a millennium, lunar impacts occur hundreds of times each year. Meteor showers, such as the Leonids in November, can dump as many as 20 objects on the moon in one night.

Initially, scientists didn't think the flashes necessarily came from the moon; they might have been reflections from tumbling satellites or some other kind of phenomenon. Then, debate revolved around whether impacts or something in the moon such as volcanism produced the transient flashes. Most recently, researchers couldn't decide between hot, charged particles or liquid droplets kicked up by impacts as the culprit.

To answer the question, Bouley and his colleagues looked at lunar flashes recorded from 1999 to 2007. The researchers calculated the brightness of each flash, plus the probable sizes and speeds for 54 collisions. Most impactors were around 10 centimeters in diameter and traveled at speeds of up to 72 kilometers per second, Bouley says.

Knowing the ingredients and brightness allowed the scientists to estimate the temperature and energy produced during each collision. They found that impacts were hot enough to release a mix of gas and liquid from the destroyed impactor. Some of that liquid, called melt droplets, produces light as it cools, creating the flash.

Astronomer Bill Cooke, who leads NASA's Meteoroid Environment Office at the Marshall Space Flight Center in Huntsville, Ala., has created impact flashes in the laboratory by shooting aluminum spheres into simulated lunar dirt. The new study "pretty much confirms what we were suspecting," he says. "But these guys are the first to put that suspicion into hard numbers."

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Antibiotic fails sinus infection test

Medicine can't clear blocked passages better than placebo

By Nathan Seppa

Anyone who has felt the pressure of a weeklong sinus infection won't be happy to hear it, but a study finds that a commonly prescribed medicine doesn't clear up such attacks any better than a placebo.

The findings, in the Feb. 15 *Journal of the American Medical Association,* don't apply to people who have chronic sinus infections lasting 28 days or more. But people with trademark signs of an acute sinus infection — yucky drainage, facial pressure, congestion and headache for a full week — overall fared no better with antibiotics than did people getting inert pills, scientists at Washington University in St. Louis report.

"This struck me as a very well-designed, -conducted and -analyzed study," says James Hughes, an infectious disease physician at Emory University in Atlanta. "It adds to evidence that in most patients with acute sinus infections, antibiotics don't add value."

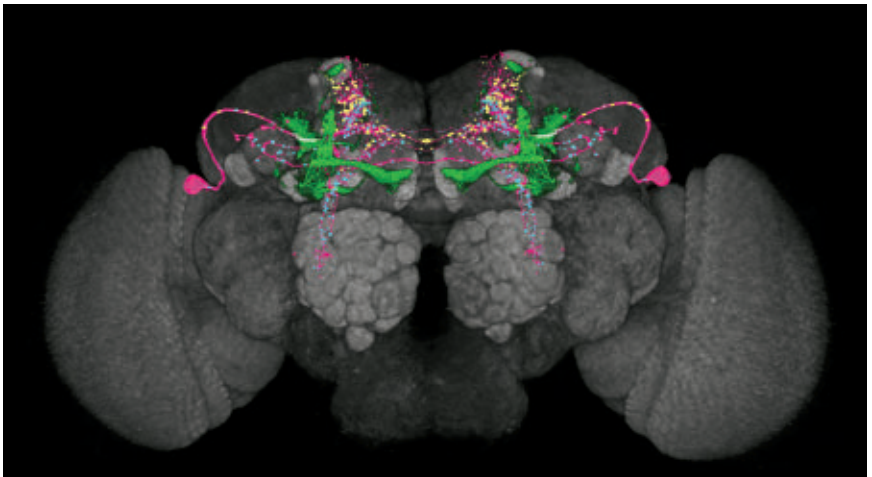
The researchers randomly assigned 166 adults with sinus infections to get either amoxicillin or a placebo three times a day for 10 days. All patients received other drugs for symptom relief as needed. Three days after treatment started, the two groups had improved at the same pace. Seven days out, slightly more patients getting antibiotics reported improvement, but this edge disappeared by day 10 when about four-fifths of each group reported "significant improvement" in sinus infections, says study coauthor Jane Garbutt, a physician and researcher at Washington University.

James Gill, a practicing physician who also heads Delaware Valley Outcomes Research in Newark, Del., says the medical community has tried to slow the prescribing of antibiotics for sinus infections for years. "But I don't think practice patterns have changed much," he says. Doctors are under pressure from patients to do something, and offering assurance that the symptoms are likely to resolve in a week or so rarely satisfies them, Gill says.

A big part of the problem is the sinuses' inaccessibility, Hughes says. The bacteria that cause patients' misery hole up and overproduce in the sinus cavities when they become blocked by excess mucus production, typically triggered by a respiratory infection. But culturing those holed-up bacteria is tricky, since readily obtained nasal microbes might be different from what's growing farther in, which cannot be sampled without invasive techniques, Hughes says.

Without cultures, Garbutt says, targeting sinus infections with drugs is "a best guess." Her team used amoxicillin because it is effective against *Streptococcus pneumoniae,* a common culprit in sinus infections. To make sure the drug had a good chance of working, the researchers obtained and tested simple nose swabs from children in the surrounding communities beforehand. The team found little *S. pneumoniae* resistance to amoxicillin. Despite that, the antibiotic ultimately showed no benefit.

Gill says even the correct antibiotic often fails to knock out a sinus infection because the bacteria "are socked into closed spaces" in the sinuses, where drugs just don't reach them well. ■



SCIENCE/AAAS

Two cells make fly memories last

Of the 100,000 nerve cells in the fruit fly brain, two have a special role in memory. Positioned on the front of the brain, one on each side, this duo of nerve cells (shown in pink) churns out proteins that are essential for fruit flies to form, store and retrieve long-term memories, Chun-Chao Chen of National Tsing Hua University in Taiwan and colleagues report in the Feb. 10 *Science*. When the researchers prevented these two nerve cells from making proteins after a training session, the flies' ability to remember an odor diminished. Surprisingly, these two large nerve cells, called the dorsal-anterior-lateral neurons, reside outside brain regions that are typically thought of as the fruit fly's memory centers — L-shaped structures called the mushroom bodies (shown in green). — *Laura Sanders*

"In most patients with acute sinus infections, antibiotics don't add value." —JAMES HUGHES

Brain cells know how you will bet

Nucleus accumbens neurons foretell card-game decisions

By Laura Sanders

When it comes to tough financial decisions, people are often clueless. But some cash-savvy nerve cells deep in the brain know what to do. And these cells know the plan seconds before the person actually decides on a course of action, new research shows.

The findings, presented February 25, may help scientists understand how people make difficult decisions.

Shaun Patel of Massachusetts General Hospital and colleagues studied eight people undergoing an experimental therapy to alleviate severe depression or obsessive-compulsive disorder that involved implanting electrodes deep in the brain.

During surgery, the electrodes eavesdropped on the behavior of individual nerve cells in an otherwise unreachable brain structure called the nucleus accumbens. Other places in the brain feed lots of diverse signals to the nucleus accumbens: Information about a person's emotions and memories as well as more sophisticated reasoning — key ingredients for decision making — all flow into this structure.

While in the operating room, participants played about 250 rounds of a simplified version of the card game "War," in which two players each receive a card, and the higher card wins. The deck contained only the two, four, six, eight and 10 of spades.

Participants saw a video screen with their card face up next to a face-down opponent's card. Players pushed one of two buttons to bet either $5 or $20 that they'd beat their opponent. Then the opponent's card was flipped over, and the participants saw the results of their wager.

"The brain is presumably calculating these things before you're conscious of it." SHAUN PATEL

As expected, the participants quickly bet high when they drew a 10 of spades, and quickly bet low when they drew a two. When a participant was dealt a six, the decision took longer and went either way.

Meanwhile, researchers detected 19 nerve cells in the nucleus accumbens that seemed to be involved in the betting. Electrical signals from these cells predicted whether a person would bet high or low. Most surprising, this nerve cell pattern was evident about 2.8 seconds before a player pushed a button — a delay so long that it's "unheard of in neuroscience," Patel said.

These nerve cells receive information from other brain systems and call the shots fast, before the rest of the brain catches up, Patel said. "The brain is presumably calculating these things before you're conscious of it."

For difficult decisions, such as whether to bet high or low on a six of spades, a few key outbursts from this handful of nerve cells might be the deciding factor.

Some of these nerve cells also seemed to respond later, after the opponent's card was flipped and the participant unexpectedly won or unexpectedly lost. A victory with a four, for instance, was linked to activity in some of these cells.

Neuroscientist Naoshige Uchida of Harvard University cautions that the results are based on the average behavior of a small number of nerve cells. Nonetheless, experiments like these that reveal nerve cell behavior in human brains hold promise, he says. "I think it's a fascinating direction to go in." ■

MEETING NOTES

How the worm bends

Each section of a squirming worm's body follows the leader, a study presented February 25 shows. Quan Wen of Harvard University and his colleagues confirmed a long-held theory about how some worms wiggle by rigging up a device that could monitor and control the undulations of the worm *Caenorhabditis elegans*. The device pinned the worm once near the head and again near the tail. A worm constrained like this could no longer wiggle anything but the head segment. Forcing a mid-section bend caused the tail to bend, too. The curve of one section depended on the curve of the section preceding it. By stimulating the motor nerve cells responsible for the bend, the team found that a curved conformation can be set and forgotten — staying in a bend doesn't require the constant help of motor nerve cells. — *Laura Sanders*

Creating a vision

A flash of light shined on brain cells can make monkeys see something that's not there. That finding comes from a technique called optogenetics, which so far has been used to influence behavior in rodents, flies and worms, but never before in primates. In a new study presented February 25, Mehrdad Jazayeri of the University of Washington in Seattle and colleagues inserted a gene for a light-responsive molecule into select nerve cells in two rhesus monkeys' visual systems. When a burst of light hit these cells, the monkeys moved their eyes toward a particular place on a computer screen, even though nothing was there. The ability to precisely manipulate nerve cells in monkeys will allow scientists to test more complex theories about how the brain works. — *Laura Sanders*

Humans

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Little babies know common nouns

Even at 6 months, infants recognize names of objects

By Bruce Bower

By age 6 months, infants on the verge of babbling already know — at least in a budding sense — the meanings of several common nouns for foods and body parts, a new study finds.

Vocabulary learning and advances in sounding out syllables and consonants go hand in hand starting at about age 6 months, say graduate student Elika Bergelson and psychologist Daniel Swingley of the University of Pennsylvania.

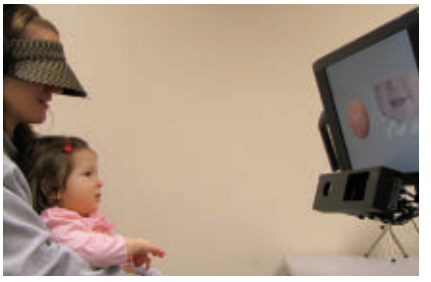
Bergelson and Swingley's findings challenge the influential view that word learning doesn't start until age 9 months. Babies blurt out their first words around 1 year of age.

"Our guess is that a special human desire for social connection, on the part of parents and their infants, is an important component of early word learning," Bergelson says. The work is published online February 13 in the *Proceedings of the National Academy of Sciences*.

In the study, 33 infants ages 6 to 9 months and 50 kids ages 10 to 20 months sat on their mothers' laps in front of a computer connected to an eye-tracking device. Even at 6 months, babies looked substantially longer at a picture of hair paired with a picture of a banana when their mothers said, "Look at the hair," compared with the time the tots spent looking at the hair when their mothers said, "Look at the banana." Infants also homed in on the nose on a woman's face after their mothers asked, "Do you see the nose?"

Tots' recognition of words for foods and body parts shot up at age 14 months, possibly due to improved understanding of sentences and of the experiment as a game of object searching, Bergelson says.

Although mothers in the new study generally did not realize that their 6- to 9-month-olds were familiar with food and body-part words, babies show signs of recognizing *mommy*, *daddy* and other frequently heard words by those ages.



A 10-month-old plays a word-recognition game with her mother. Infants recognize object names long before speaking.

That's not the same as understanding what those sound patterns mean. Six- to 9-month-olds probably understood either that certain spoken sounds stood for specific objects or that particular utterances regularly accompanied the appearance of specific objects, says psychologist Richard Aslin of the University of Rochester in New York.

Vodka delivers shot of creativity

Boozy glow may provoke problem-solving insights

By Bruce Bower

Getting a buzz from booze may boost creativity. Men who drank themselves tipsy solved more problems demanding verbal resourcefulness in less time than sober guys did, a new study finds.

Sudden, intuitive insights into tricky word-association problems occurred more frequently when men were intoxicated but not legally drunk, say psychology graduate student Andrew Jarosz of the University of Illinois at Chicago and his colleagues. A moderate alcoholic high loosens a person's focus of attention, making it easier to find connections among remotely related ideas, the scientists propose online January 28 in *Consciousness and Cognition*.

In the study, 20 social drinkers watched an animated movie while eating a snack. Volunteers then drank enough of a vodka cranberry drink to reach an average peak blood alcohol level of 0.075 percent, just below the current 0.08 percent cutoff for legal intoxication in the United States. Another 20 social drinkers watched the same movie without eating or drinking.

Men in both groups then completed a creative problem-solving task. For each of 15 items, volunteers saw three words — say, *peach*, *arm* and *tar* — and had to think of a fourth word that forms a phrase with each of them, such as *pit*.

On average, participants at peak intoxication solved about nine problems correctly, versus approximately six winners for the sober crowd. It took an average of 11.5 seconds for intoxicated men to generate a correct solution, compared with 15.2 seconds for sober men. The groups performed comparably on the test before the study began.

Jarosz and his colleagues suspect their finding also applies to artistic inspiration. "A composer or artist fixated on previous work may indeed find creative benefits from intoxication," they say.

Jarosz's team offers an intriguing glimpse at how alcohol prompts intuitive insights into problems that require searching preexisting knowledge, says psychologist Mark Beeman of Northwestern University in Evanston, Ill. Further studies with intoxicated volunteers should employ complex tests that require information gathering and recognition of novel patterns, key features of many real-life problems, he suggests.

E. BERGELSON

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Genes & Cells

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Yeast may use protein clumps

Malformed proteins might help organisms evolve

By Rebecca Cheung

A special set of misfolded proteins known as prions may offer yeast a trial run at different traits before permanent changes are made to the genetic blueprint, a new study finds.

In yeast, prions cause a wide variety of new characteristics that are not wired into DNA but can still be passed on to daughter cells. The changes might act like prototypes that a cell can try out before incorporating them into DNA, scientists at the Whitehead Institute for Biomedical Research in Cambridge, Mass., report in the Feb. 16 *Nature*.

"This is opening up a whole new world of work for scientists and a whole new world for people to understand how evolution occurs," says Yury Chernoff, a biologist at the Georgia Institute of Technology.

For the most part, prions have attracted attention because some variant forms cause diseases, like Creutzfeldt-Jakob disease in people and scrapie in sheep.

In prion states, proteins change shape and cause other proteins to do so, too. These misshapen proteins come together in organized clumps, or amyloids. These clumps stop the individual proteins from functioning properly.

Though these protein clumps had been identified in many types of yeast grown in artificial lab conditions, it was unclear whether prions in yeast played a biologically important and nonharmful role out in the wild.

Whitehead researcher Susan Lindquist and colleagues tackled these unknowns by screening about 700 strains of yeast. Many of these strains were collected from natural sources, such as soil, insects and human patients.

One-third of the yeast contained clumps of misfolded proteins.

The scientists paid particular attention to yeast that contained clumps of Sup35, a protein involved in making sure that a cell's proteins are cut to the right length.

Some types of yeast with Sup35 clumps were able to adapt under stressful conditions, such as in environments with high acidity or those containing DNA-damaging drugs. Certain adaptive advantages also appeared in yeast containing clumps of Mot3, a protein that mediates the transcription of cell wall–building genes.

Overall, about 40 percent of changes brought on by the protein clumps appeared to boost yeast growth under stressful conditions, the researchers found.

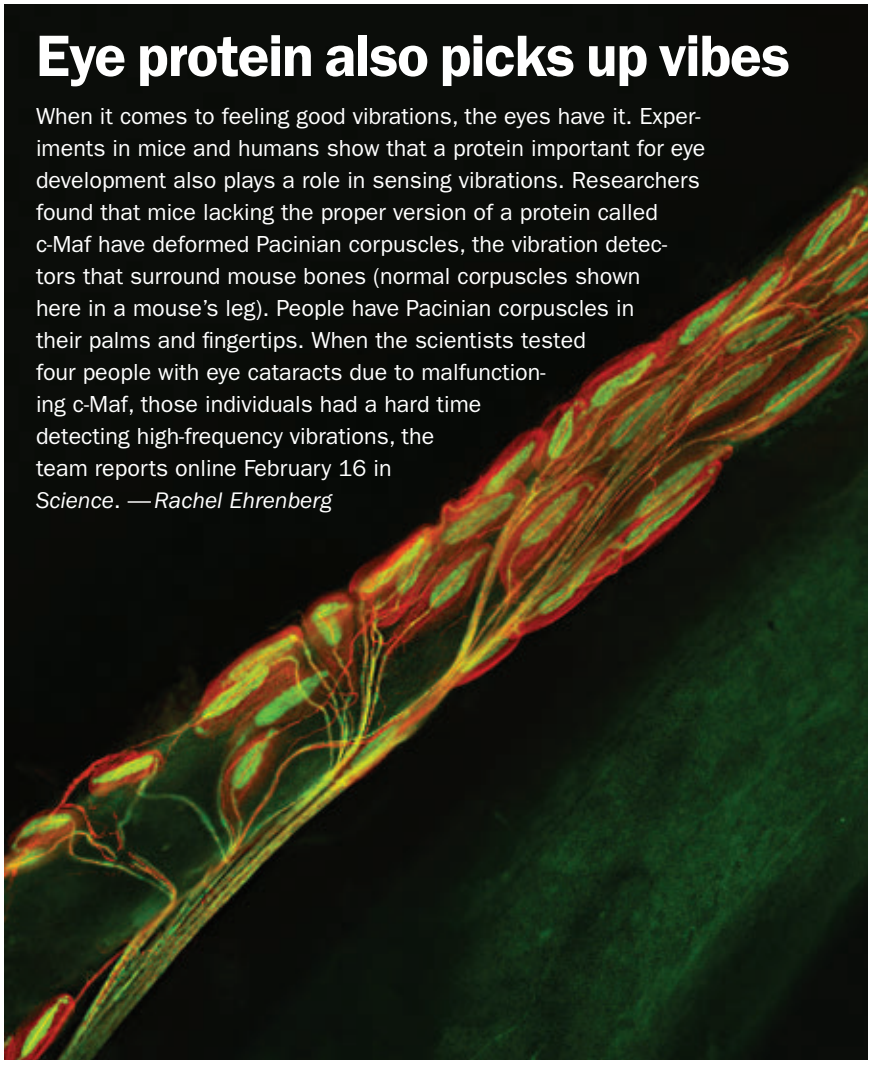
Scientists are not sure exactly how these traits might become incorporated into the yeast DNA.

Still, coauthor Randal Halfmann of the University of Texas Southwestern Medical Center in Dallas, says these findings suggest that prions introduce flexible changes to yeast to test out before hardwiring the traits into the DNA.

"We've found these prions in hundreds of strains and they are conferring all kinds of really interesting biology to the cells," Lindquist says. "This isn't just an interesting or cool little oddity." ■

Eye protein also picks up vibes

When it comes to feeling good vibrations, the eyes have it. Experiments in mice and humans show that a protein important for eye development also plays a role in sensing vibrations. Researchers found that mice lacking the proper version of a protein called c-Maf have deformed Pacinian corpuscles, the vibration detectors that surround mouse bones (normal corpuscles shown here in a mouse's leg). People have Pacinian corpuscles in their palms and fingertips. When the scientists tested four people with eye cataracts due to malfunctioning c-Maf, those individuals had a hard time detecting high-frequency vibrations, the team reports online February 16 in *Science*. —*Rachel Ehrenberg*



COURTESY OF HAGEN WENDE AND CARMEN BIRCHMEIER

"This isn't just an interesting or cool little oddity." —SUSAN LINDQUIST

Gene pits eating against sleeping

DNA variant lets flies cope sans slumber until food gets low

By Tina Hesman Saey

Some people can forgo sleep and stay sharp. But a new experiment with fruit flies suggests that even those gifted people may be making an evolutionary trade-off that ensures sleep is here to stay.

A variation in a single gene enables a strain of fruit flies nicknamed "rovers" to learn and remember after a sleepless night, scientists report February 14 in the *Proceedings of the National Academy of Sciences*. But the flies that cope well with sleep deprivation appear more vulnerable to vagaries in food supply.

The findings may eventually help scientists answer one of the most "fundamental questions in the sleep field, that is 'what is the core function of sleep?' " says David Raizen, a neuroscientist at the University of Pennsylvania.

In the new work, Marla Sokolowski, a behavioral geneticist at the University of Toronto Mississauga, and her colleagues describe how fruit flies with naturally differing versions of a gene called "foraging" behave. Flies with the rover version of the gene make more of a protein called protein kinase G, or PKG. Rovers also move around more in search of food than flies with the "sitter" version of the gene, which produces lower levels of PKG.

With the advantage of being able to learn and remember in the face of sleep deprivation, rovers ought to have completely taken over the fruit fly population. Instead, sitters make up about 30 percent of the fruit fly population in the orchards where Sokolowski first discovered the two types of flies. Now the researchers think they know why the rovers don't have an evolutionary monopoly: Flies that can defy sleep deprivation are more sensitive to starvation.

Sitters had trouble learning after being up all night. But the flies' short-term memories improved when food was withheld for 12 hours. The rovers, which seemed like "über-duper super flies" when sleep deprived, had impaired memories when starved, says neuroscientist and study coauthor Paul Shaw of Washington University in St. Louis.

The rover flies also dropped like, well, flies if starved for days. While sitters could survive several days without food, most rovers died within 41 hours of starvation. Such poor performance when food is scarce may explain what keeps rovers from dominating wild populations. ■

Environment

1.1 million Water footprint of average China resident, liters/year

2.8 million Water footprint of average U.S. resident, liters/year

Gas wells leakier than thought

Measurements show twice as much methane escaping

By Devin Powell

Wells that pump natural gas from the ground in Colorado have leaked about twice as much gas into the atmosphere as previously thought, a study published February 21 in the *Journal of Geophysical Research* finds.

That could tarnish gas's image as a clean source of energy. Natural gas, made mostly of methane, does give off less carbon dioxide than coal when burned. But methane itself strongly warms the atmosphere, which means even relatively small releases can have a big impact on the climate.

For the new study, scientists monitored air quality near Denver using sensors mounted on a 300-meter tower perched on the southwestern edge of the Denver-Julesburg Basin, an area that feeds more than 20,000 natural gas wells.

When winds blew in from the basin, levels of methane detected by sensors on the tower spiked. Landfills, cattle feedlots and wastewater treatment plants probably belched some of the gas into the sky. But methane from the gas wells was accompanied by other components that allowed it to be fingerprinted, report atmospheric scientist Gabrielle Pétron, of the National Oceanic and Atmospheric Administration, and her colleagues.

These measurements suggest that about 4 percent of the methane produced by the gas wells was leaking. Previous studies by the U.S. Environmental Protection Agency and by industry groups pegged this loss at between 1 and 2 percent. But the earlier estimates were done by measuring leakages from individual pieces of equipment.

"You tend to underestimate things when you do that kind of bottom-up approach," says Robert Howarth, a biogeochemist at Cornell University.

Food exports can drain arid zones

Trade in agricultural products can increase water stress

By Susan Milius

About a fifth of the water that humankind now uses gets exported from one country to another — though rarely as anything that can splash into a glass.

Understanding the big blue picture of water resources means getting over the notion that water is wet. Ninety-two percent of water used planetwide goes into agricultural production, according to the latest accounting from Arjen Hoekstra and his water research group at the University of Twente in the Netherlands. So for 1996 through 2005, Hoekstra and colleagues tracked "virtual water," a combination of actual liquid and the shares of water used in industry and in growing wheat, beef and other products.

This accounting highlights the various degrees to which nations depend on foreign water. Some arid countries take a whopping portion of their virtual water from outside their borders (Israel, 82 percent; Kuwait, 90 percent). But so do relatively watery places such as the United Kingdom (75 percent) and the Netherlands (95 percent), the researchers report online February 13 in the *Proceedings of the National Academy of Sciences*. The United States, which exports more virtual water than it imports, still reaches outside its borders for 20 percent of its consumption.

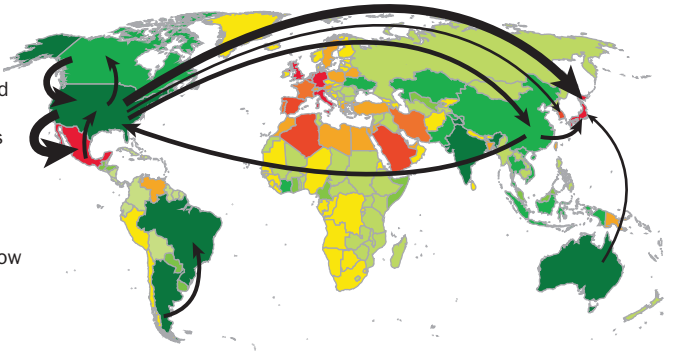
A worldwide trend toward eating more animal products and processed foods could increase demands for water. Producing a gram of protein in milk, eggs and chicken meat typically requires at least half again as much water as delivering a gram of legume protein, Hoekstra and Twente colleague Mesfin Mekonnen report online January 24 in *Ecosystems*.

Creating a half-liter bottle of a sweetened soft drink swallows between 170 and 310 liters of water, Hoekstra's group has calculated. About 95 percent of this total goes into growing and processing the ingredients, although the amount varies considerably depending on the kind of sweetener and where it's produced.

The new paper offers little detail about the industrial side of humankind's water footprint, says ecological economist Klaus Hubacek of the University of Maryland in College Park. Even though agriculture dwarfs its demands, industrial water matters, certainly in terms of pollution. Hubacek and his colleagues are working on their own analysis that will illuminate how the purchase of inedible products affects water resources.

Big flows
Countries in green exported more virtual water than they imported from 1996 to 2005. Yellow and red countries were net importers. Arrows show directions of largest virtual water flows. (Virtual water includes that used to grow crops or make goods.)

SOURCE: A.Y. HOEKSTRA AND M.M. MEKONNEN/*PNAS* 2012



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Science & Society

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Mapping life and death of words

Analysis identifies lexical victims of shifting influences

By Rachel Ehrenberg

Within the quiet pages of books, words are battling it out with a competitive fierceness that rivals Wall Street's. New research examining the frequency of words used in books over more than 200 years reveals the rise and demise of various words through time and how social, technological and political change influence language.

An international team of scientists investigated word histories using Google's Ngram project, a database of words in seven languages developed from scanning and digitizing about 4 percent of the world's texts. The researchers mined books printed in English, Spanish and Hebrew published between 1800 and 2008, a corpus of more than 10 million words.

There's a marked increase in the death rate of words that coincides with the modern print era, the researchers found. That trend intensified with the advent of stricter publishing procedures, and later computerized editing and spell-checking technologies, which led to the extinction of various misspelled words or less-popular synonyms.

Incorrect or nonstandard spellings weren't the only cause of word death. *Roentgenogram* — which comes from Wilhelm Röntgen, who discovered X-rays — faced competition from *radiogram* and *X-ray*, which ultimately triumphed, Joel Tenenbaum reported February 28.

"Each of the words is competing to be a monopoly on who gets to be the name," said Tenenbaum, of Boston University. "*Of, the, an* — those are the blue chips of words, like *Microsoft*." Tenenbaum conducted the research with Alexander Petersen of IMT Institute for Advanced Studies Lucca in Italy and others.

Political forces may also shape the trajectory of a word or phrase, the researchers found. *The Great War*, for example, which was used to describe World War I, fell out of use around 1939 when people realized it wasn't actually the war to end all wars.

And wars shaped language in other ways. There's a marked spike in the birth rate of Hebrew words around 1920 following a surge in political and popular endorsement of the creation of a national homeland for the Jewish people. Hebrew had been primarily used in religious texts but then surged as a modern, spoken language.

An intriguing open question is whether a thorough examination of phrases would yield similar trends, said Paul Ginsparg of Cornell University. Indeed: *Google* has gone from being an extremely large number (spelled *googol*) to a proper noun or verb that's typically attached to the term "it." ■

Origins revealed by mapping paths

Modeling strategy can trace roots of widespread phenomena

By Rachel Ehrenberg

Predicting the future is notoriously difficult, but uncovering the past can be just as tricky. Now researchers have developed a method that looks backward and may reveal where a widespread phenomenon originated, be it the outbreak of a disease or the introduction of a new technology.

Typically techniques for deriving the origin of something rely on the notion that whatever is spreading will take a certain time to travel a certain distance. But with planes, trains and automobiles, geographic distance by itself is no longer a good predictor of arrival time, Dirk Brockmann of Northwestern University in Evanston, Ill., reported February 28. That population densities aren't uniform across an area makes estimating spread using geography alone even more difficult.

The new method still relies on distance: Just as diagramming the relationships among friends can yield close or "coupled" people, even if they live far apart, diagrams of relationships among locations that consider the traffic between them can yield coupled locations. Using such relationships, Brockmann and his colleagues came up with a way to compute paths that are in effect the shortest between locations, even if they are far apart geographically.

Once that path diagram is in hand, the researchers can test whether various starting points might be the root of the branching, treelike spread of whatever phenomenon is being studied. A clean, circular diagram emerges when the correct root is identified, computer simulations reveal.

An open, circular diagram (top) of the shortest paths between locations can reveal a disease or innovation's origins. Incorrect locations yield a messy burst (bottom).

R. BRUNE, C. THIEMANN, D. BROCKMANN

"Computer simulations are among the most useful tools in our armory," says Bill Hanage, an epidemiologist at Harvard School of Public Health who has been tracing the origins of last year's *E. coli* outbreak in Europe. Such simulations are particularly helpful if they work even with poor or biased samples of data, he says. ■

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By any name, it's science news

At its inception, the organization originally known as Science Service planned to provide news of the latest scientific research to established syndicates for distribution to newspapers and other media. But the syndicates weren't that interested. One offered to buy 400 words' worth of science news a day, at three cents a word. That deal didn't last long.

Fortunately, plan B was more successful. *Science News Bulletin*, a weekly mimeographed compilation of science news items, was mailed to newspapers across the country. Soon individuals, libraries and schools inquired about subscribing to the bulletin directly; with a few embellishments, it was repackaged and sold to subscribers as the *Science News-Letter* beginning in March 1922.

In the years that followed, *Science News Letter* (first losing the hyphen, then the *Letter*) became the nation's leading source of comprehensive accounts of science in action. In its pages readers learned of the bizarre new view of the atom posed by quantum mechanics, the arrival of antibiotic wonder drugs, surprising new subatomic particles and the splitting of the atom. Household words today were once neologisms introduced to many through *Science News* articles: *pulsar*, *transistor*, *DNA*, *laser*. *Science News* reported the play-by-play of the space race, the arms race and the detective work revealing the evolution of the human race. Faithful readers have encountered quarks and quasars and quantum computing; genetic engineering and genome sequencing; black holes, brown dwarfs and buckyballs; CFCs and global warming; dark energy, dark matter and water on Mars; stem cells and Dolly the Sheep; countless images from the Hubble Space Telescope and accounts of the planet Pluto's discovery and its demotion from planetary status.

Read on for other examples. You'll find that for the last 90 years, *Science News* has truly lived up to its name. — *Tom Siegfried, Editor in Chief*

On the Web To read archival *Science News* stories (dates in italics), subscribers can find links at www.sciencenews.org/90

Plum the archives

By Janet Raloff

As a freshman astronomy major, I was captivated by class discussions of black holes. Working at Chicago's Adler Planetarium later that year, I asked a staff scientist where I could learn more about wormholes, black holes and event horizons. "You won't understand the journal articles," he said. "They're essentially all math. I'd suggest *Science News*. That's where we go to read about them in plain English."

Until then, I'd never encountered the magazine. But it has been an integral part of my life ever since, including 34 years as a staff writer and editor. So it was both a privilege and a labor of love to thumb through archived issues dating back to 1922 to identify top stories from past decades of *Science News*.

The following 12 pages offer highlights of my trek through the evolution of *Science News* — and the history of science as it emerged, week by week. But this compilation doesn't even hint at the depth and breadth of our reporting. I've always argued that what distinguishes *Science News* is how amazingly catholic its coverage is, by which I mean comprehensive — reporting on physics and chemistry and what's now known as materials science every bit as intensively as health, zoology, genetics and anthropology.

In perusing more than 70,000 pages, I've confirmed this breadth began in week one of *Science News-Letter*, the publication's first incarnation. But the topics emphasized have ebbed and flowed over time. In the earliest decades, coverage leaned heavily toward breakthroughs in medicine. At the time, antibiotics were making formerly intractable diseases and epidemics survivable, as dozens of stories through the 1930s and '40s reported. The following decades saw the magazine dogging new developments from the unraveling of DNA's structure in the 1950s to the rise of environmental science in the 1970s and discoveries of exoplanets in the last few years.

Sometimes coverage turned on a dime. From the 1930s to 1957, nuclear developments — from weapons to peaceful uses of the atom — filled our pages. Sputnik changed all that (*10/19/57, p. 243*); overnight, reporting on the space age jetted to prominence. Jonathan Eberhart's comprehensive reporting

bing

for *Science News* set the gold standard for such coverage, which led the American Astronomical Society's Division for Planetary Sciences to name its journalism award in his honor.

For three decades, Jonathan's in-depth reporting swelled our pages with detailed accounts of planetary science — not the heroics of astronauts or the politics of funding, but what scientists were turning up from sensors and imaging and chemical sampling. An indomitable reporter, Jonathan would camp out for weeks (sometimes on his own dime) at NASA's Jet Propulsion Laboratory to make sure he heard everything. Enter his smoke-filled office, and you would almost always find him on the phone fact-checking some claim.

Of course, Jonathan is just one of the countless dedicated reporters who have written for *Science News*. Roughly 100 interns learned science journalism here. Several dozen staff writers — many staying a decade or more — lent their voices to assessments of which events to cover, and how. Along the way, many won awards from organizations ranging from the National Association of Science Writers and the American Physical Society to the Free Press Association. And the biggest honor — a prestigious George Polk award — went to the magazine in 1987 for excellence in science reporting.

For all its accomplishments, *Science News* also covered what — with 20/20 hindsight — proved silly, frivolous or simply absurd. One favorite: a 1956 report suggesting that within 20 years, electric ranges and wall ovens "will be replaced by a marble counter top that heats to roast the meat or bake the pie and then, in a moment or two, is cold enough to touch and use as a counter or table." Afterward, ultrasonic waves would wash the dishes in three minutes (*10/13/56, p. 231*). A 1961 story forecast that "future vacationers could be taking a round trip to the moon for the bargain price of $600." That price doesn't include tips, though, the story noted (*5/27/61, p. 328*).

Some midcentury stories made me shudder. A 1948 story described fluffy dish towels made from absorbent fabric that was 80 percent cotton and 20 percent asbestos. Readers were invited to purchase a sample for 50 cents from Things of Science, an experiment-of-the-month program run by *Science News*' parent organization, called Science Service at that time (*9/25/48, p. 204*).

A postwar story described tests of nuclear weapons that could be used against ground troops (*9/29/51, p. 195*). Plans for peaceful analogs included excavating a new Panama Canal and a harbor in Australia using nuclear explosives (*9/5/64, p. 149; 2/15/69, p. 159; 11/1/69, p. 408*). All this at a time when story after story reiterated concerns over radioactive fallout.

Such stories were the exceptions, though. Discoveries that would withstand the test of time — including many that later won Nobel Prizes — were reliably reported in our pages. A week after physicist Arthur Compton received his Nobel, for example, he penned an exclusive 1,000-word piece describing to our readers his work on X-rays (*12/17/27, p. 387*).

And we covered not just the breakthroughs, but the unfolding of science blow-by-blow. In medicine, not only cures made our pages, but also the testing of flu and polio vaccines, the risks, setbacks and minor successes. Photo-filled stories depicted cultural artifacts being unearthed around the world. And as evidence for each new subatomic particle materialized, *Science News* was right there, analyzing the data and piecing together how each find might cement — or alter — humankind's understanding of the universe.

We still do all that — but no longer only in print. Most stories now appear first online or via an app for your iPad. But trust us: Though the formats may change, our commitment to relating new developments in science and technology hasn't. ■

JIM WEBB

Janet Raloff, a *Science News* staffer for 34 years, spent nearly a year poring through the magazine's archives.

1920s

1922 | Insulin
Frederick G. Banting finds that insulin, isolated from the islets of Langerhans in the pancreas, promises to cure diabetes (*10/28/22, p. 1*). N

1922 | X-ray mutations
X-rays can cause mutations that are inherited by the next generation — at least in fruit flies (*8/19/22, p. 1*).

1923 | Heart surgery
First successful heart valve surgery is performed, on a 12-year-old girl in Boston (*9/8/23, p. 1*).

1923 | Vitamin E
A new "vitamin X" that is key to animal reproduction is reported (*1/27/23, p. 1*); the next year it would be formally named vitamin E (*3/29/24, p. 4*).

1923 | Pavlov's mice
Russian physiologist Ivan Pawlow (Pavlov) reports that mice learn to associate an electric bell with dinner after 300 lessons of the bell accompanying food (*11/24/23, p. 6*).

1924 | Jiving bees
Karl von Frisch finds that bees report to hive mates where nectar has been found with a jazzy dance (*2/23/24, p. 2*). N

1924 | Waves/particles
Light may not be waves or particles but instead act a bit like both (*2/16/24, p. 2*).

1925 | Taung Child
Anthropologist Raymond Dart cables *Science News-Letter* from South Africa with a description of a recently discovered 2.5-million-year-old hominid skull called the Taung Child (*2/21/25, p. 1*).

1925 | Scopes trial
The largest U.S. science society pledges its support of Tennessee teacher John T. Scopes (above right), who has been arrested for teaching evolution (*6/6/25, p. 1*).

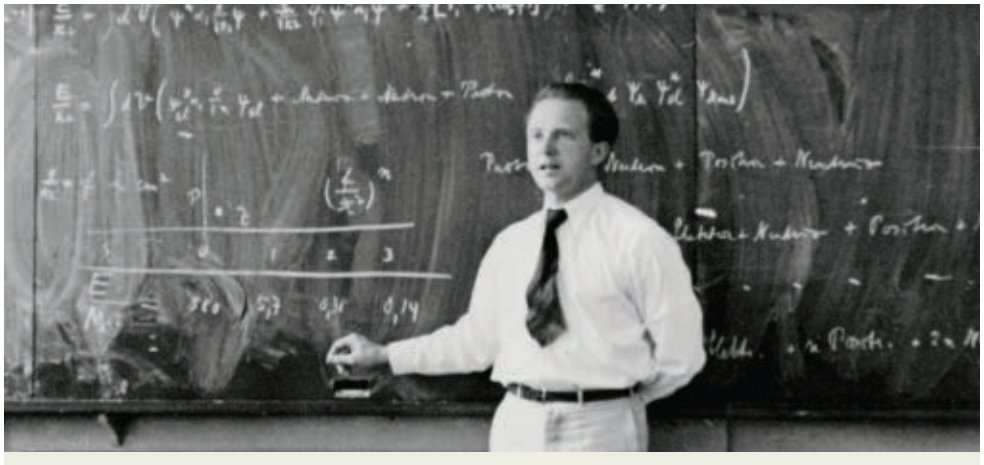
1926 | Making elements
William D. Harkins achieves transmutation of elements, converting nitrogen to fluorine and then to hydrogen and oxygen by bombarding the starting element with a helium nucleus (*5/15/26, p. 4*). A German physicist later hits gold with hydrogen to make mercury (*5/22/26, p. 2*).

1927 | AT&T TV
AT&T's new television process is described (*4/16/27, p. 237*); it uses photoelectric cells.

1927 | Gene theory
Thomas Hunt Morgan is elected president of the National Academy of Sciences and cited for developing a gene theory that established individual units of heredity (*5/7/27, p. 293*). N

1928 | Atomic theory
Erwin Schrödinger and Werner Heisenberg describe a new atomic theory in different but complementary terms, laying out the field of quantum mechanics (*3/17/28, p. 168; 10/28/33, p. 275*). N

1929 | Uncertainty
Werner Heisenberg's "principle of indeterminacy or uncertainty" is called both "revolutionary" and a "disturbing idea" by *Science News-Letter* (*4/27/29, p. 257*). N



Rise of quantum theory

Science News-Letter was born only a few years before the greatest scientific revolution since Newton, a revolution that transformed Niels Bohr's "old quantum theory" of the atom into the modern understanding of quantum mechanics. Beginning in 1925, Werner Heisenberg (above), Erwin Schrödinger, Max Born, Paul Dirac and others created the math of physics's future, culminating in Heisenberg's famous uncertainty principle. "It is as yet an impossible task to describe this theory in simple language," Bertrand Russell wrote of quantum mechanics in a book excerpt appearing in *Science News-Letter* in 1928 (*3/17/28, p. 168*). In 1929, *Science News-Letter* wrote of "Heisenberg's indetermination principle," suggesting that it was "destined to revolutionize the ideas of the universe held by scientists and laymen to an even greater extent than Einstein's relativity." The article also suggested that "in the new idea that uncertainty rules the universe, dreamers and mystics will see the abode of their fancies" (*4/27/29, p. 257*). *—Tom Siegfried*

FROM TOP: WATSON DAVIS/SMITHSONIAN INSTITUTION/WIKIMEDIA; AIP/PHOTO RESEARCHERS, INC.

N indicates findings that went on to win a Nobel Prize.

1930s

1930 | Pluto
Clyde Tombaugh discovers Pluto, a new planet predicted 25 years earlier by Percival Lowell (*3/22/30, p. 178, 179, 180, 181, 186, 190; 3/29/30, p. 197*).

1930 | Vitamin C
Albert Szent-Györgyi reports isolating hexuronic acid, later identified as vitamin C (*9/20/30, p. 184; 5/7/32, p. 292*). N

1931 | Deuterium
Heavy hydrogen atoms, now known as deuterium, are discovered by Harold Urey and George M. Murphy (*12/19/31, p. 387*). N

Germ warfare

Alexander Fleming's Nobel Prize–winning discovery of a germ-fighting constituent from mold (left)—penicillin (*5/17/30, p. 314*)—launched a renaissance in the control of infectious disease. The drug became so pivotal in fighting battlefield infections that civilian supplies had all but dried up by 1943. That prompted one researcher to share a detailed recipe, reported in *Science News Letter*, so that any doctor could "if he wishes make in his own home kitchen a supply of crude penicillin for treatment of … infections in or near the surface of the skin" (*11/27/43, p. 350*). A second major family of antibiotics—the sulfa drugs—also began around the same time to knock out formerly lethal or intractable infections, from tuberculosis to meningitis and scarlet fever. Before the 1930s were done, Gerhard Domagk, who discovered the first sulfonamide antibiotic, would be recognized with a Nobel, beating Fleming by six years. *—Janet Raloff*

1931 | Mayan translator
Mayan glyphs are deciphered for the first time (*9/3/31, p. 147*).

1932 | Neutron
James Chadwick discovers the neutron, an uncharged particle in the atomic nucleus (*3/5/32, p. 143*). N

1932 | Positron
Carl Anderson reports discovering a positively charged subatomic particle, later dubbed the positron—the first example of antimatter (*9/24/32, p. 197*). N

1933 | Radio astronomy
Karl Jansky's discovery of a shortwave radio hiss coming from the Milky Way's heart is widely publicized, marking the beginning of radio astronomy (*6/3/33, p. 339*).

1933 | Defibrillation
A strong electrical shock is found to restore a heartbeat to surgical patients whose hearts have begun fibrillating or have stopped (*5/20/33, p. 317*).

1934 | Radioactivity
Irène Joliot-Curie and husband Frédéric Joliot create the first "artificial radioactivity" by bombarding boron with alpha particles (*2/10/34, p. 83; 3/3/34, p. 133*). N

1934 | Acetylcholine
Henry Dale reports the discovery of acetylcholine, a chemical released by nerves to command a muscle to move (*10/27/34, p. 266*). N

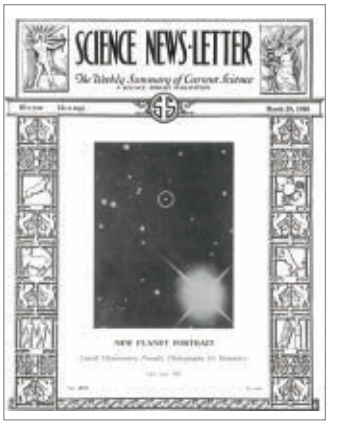
1935 | Alpha, beta brain
Scientists use electroencephalographs to show

Tracking Pluto's rise and fall

When Pluto was discovered in 1930, *Science News-Letter* ran six stories about the unnamed planet in the March 22 issue, describing the mysterious orb as "black as coal, dense as zinc." One article speculated on whether the new planet might be named for Percival Lowell, who predicted its existence, or perhaps be called Minerva after the goddess of wisdom, or even President Herbert Hoover. The next issue brought a cover portrait of "Planet X" (right), and plenty more stories followed.

As for the 24-year-old astronomer who found Pluto, Clyde Tombaugh: He became the first winner of a four-year Kansas University scholarship (*7/18/31, p. 40*) created in honor of the first editor and publisher of *Science News-Letter*, Edwin Slosson.

Eventually Pluto lost its planethood (*9/2/06, p. 149*), but decades before, the magazine was explaining why some astronomers thought it had never warranted planetary status in the first place (*2/11/56, p. 85; 10/3/64, p. 213*). *—Janet Raloff*



TOP: G. WANNER/SCIENCEFOTO/GETTY IMAGES

1930s

that two types of electrical waves, labeled alpha and beta, occur in the brain (*1/19/35, p. 35*).

1936 | Antibiotics
Major new antibiotics, later known as sulfanilamides, are developed in Germany and show promise in U.S. tests against *Streptococcus* infections (*11/28/36, p. 339*). **N**

1937 | Muon
A new subatomic particle somewhere between an electron and a proton in mass, later termed the muon, is reported from debris of cosmic ray bombardments (*5/8/37, p. 291; 5/29/37, p. 349; 11/27/37, p. 339*).

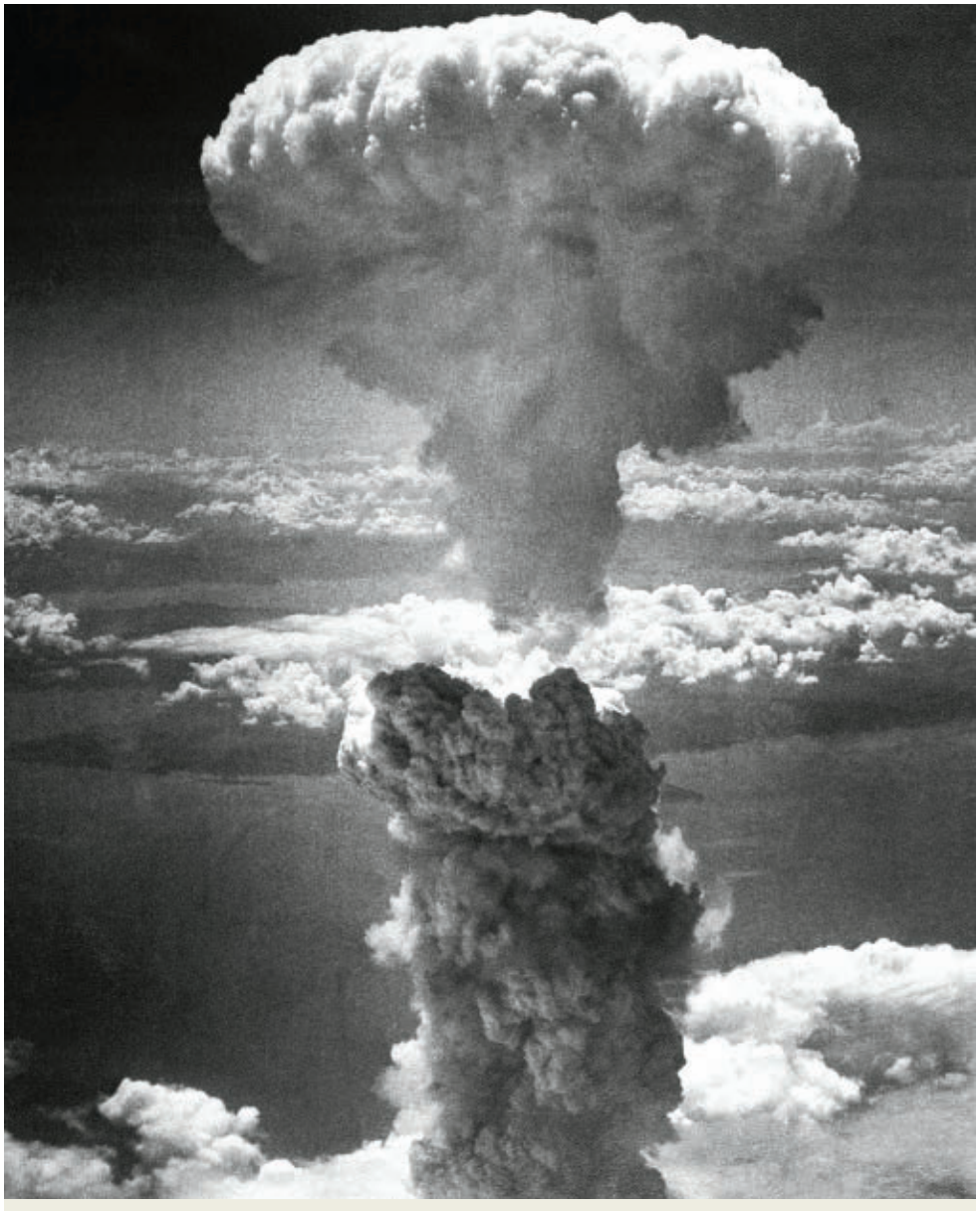
1938 | Synthetic silk
E.I. du Pont de Nemours & Co. is preparing to market nylon, a synthetic "silk" fiber, invented by late chemist Wallace Hume Carothers (*10/1/38, p. 211*).

1938 | Nuclear stars
Nuclear physicist Hans Bethe describes how hydrogen atoms inside stars combine to form helium, releasing vast amounts of energy in the process (*12/31/38, p. 425*). **N**

1939 | Splitting uranium
Scientists from Germany report the release of energy from splitting uranium atoms (*2/11/39, p. 86*). **N**

1939 | Fluorine
Epidemiological data show that adding fluorine to drinking water cuts the risk of cavities (*6/10/39, p. 365*).

1940s



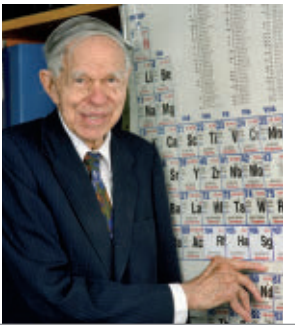
Mushroom clouds usher in atomic age

Less than three years separated the first self-sustaining nuclear chain reaction on December 2, 1942, and the production and use of the first nuclear bombs against Hiroshima and Nagasaki (above). In 1946, weapons tests at Bikini Atoll—some witnessed by embedded *Science News Letter* reporters (*7/13/46, p. 22; 8/3/46, p. 67; 8/10/46, p. 84*)—brought home the field-acquired details of long-lasting mutation risks. At the end of the decade President Truman announced, "We have evidence that within recent weeks an atomic explosion occurred in the U.S.S.R.," launching what would come to be known as the nuclear arms race. The president offered no details, but *Science News Letter* explained how such surreptitious weapons tests could have been identified and authenticated (*10/1/49, p. 211*). —*Janet Raloff*

Elementary finds stack up

Throughout the history of *Science News*, scientists have steadily expanded the periodic table—from hafnium, element number 72 (*3/3/23, p. 4*), to element 117, temporarily called ununseptium (*4/24/10, p. 15*). Along the way were surprises: For example, finding illinium (later replaced by promethium) did not leave just two more elements to discover, as initially claimed in 1926.

In 1951, Glenn T. Seaborg (shown) and Edwin McMillan shared the chemistry Nobel for using atom smashers to create six elements and some 100 new isotopes (*11/24/51, p. 323*). Seaborg and his team would go on make many more discoveries (covered in nine follow-up stories). For these achievements, Seaborg was honored by having element 106 named for him (*3/19/94, p. 180*)—a decision that was unsuccessfully contested (*10/22/94, p. 271; 4/12/97, p. 228*).



Seaborg's gangly frame and wide smile were familiar to *Science News* staffers, as he ambled down office hallways several times a year. From 1966 to 1995, he chaired the board of trustees for *Science News*' parent organization, now known as Society for Science & the Public. He was the first of three Nobelists to do so, and one of eight laureates to serve on the board. —*Janet Raloff*

1940 | Radar for planes
David G.C. Luck describes radar and it potential use in plane navigation (*7/13/40, p. 29*).

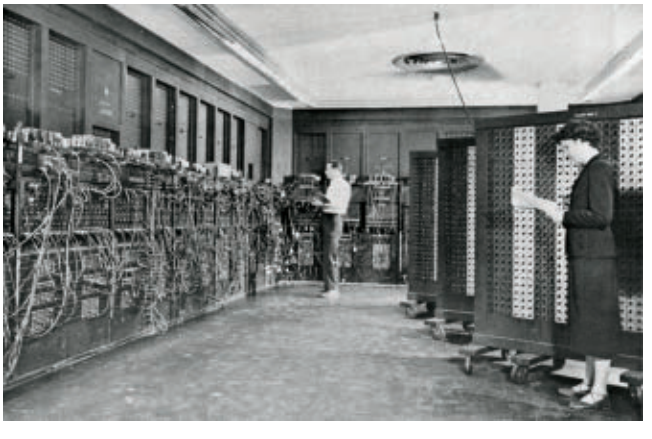
1940 | Lascaux cave art
French schoolboys call anthropologists' attention to 30,000-year-old prehistoric cave art (above) in Lascaux in late 1940 (*2/8/41, p. 85*).

1941 | Carbon dating
Radiocarbon tracers for medicine using carbon-14 are reported (*3/15/41, p. 163*), and scientists describe the use of carbon for dating objects more than 20,000 years old (*3/12/49, p. 171*). N

1942 | Nuclear reaction
The first human-controlled self-sustaining nuclear chain reaction takes place on December 2, 1942, at the University of Chicago's Stagg Field (*12/6/52, p. 358*).

1943 | Epidural magic
Details of an epidural nerve block that allows pain-free childbirth without putting women to sleep are reported (*1/30/43, p. 67*).

1944 | Toxic pesticides
Data begin to show that DDT and other widely used pesticides, while effective, could prove toxic to people and other animals (*8/5/44, p. 90; 11/11/44, p. 310; 12/23/44, p. 402*).



1945 | Bombing Japan
The United States drops two nuclear bombs on Japan (*8/18/45, p. 102, 103*).

1945 | Autism
Leo Kanner reports on his studies of a mental illness in 20 children that causes them to largely ignore the people around them, a disease that would come to be called autism (*8/11/45, p. 92*).

1946 | Bikini bombing
Stories predict what the coming Bikini Atoll nuclear tests would do to ships and the local environment (*2/2/46, p. 78; 2/23/46, p. 116; 5/11/46, p. 294; 6/1/46, p. 346; 6/22/46, p. 394; 7/6/46, p. 3*).

1946 | ENIAC computer
The University of Pennsylvania rolls out the first all-electronic general-purpose digital computer (left), called ENIAC (*2/23/46, p. 118*).

1947 | Chemical mutation
Experiments in mice show that chemicals can—like radiation—induce mutations (*1/11/47, p. 20*).

1947 | Atomic clock
The U.S. National Bureau of Standards reports atomic timekeeping accurate to a millionth of a second (*1/11/47, p. 22*).

1947 | Transistor
Transistors (first one shown below) could replace vacuum tubes (*7/10/48, p. 19*). N

1948 | Photosynthesis
Scientists lay out the steps of photosynthesis (*1/10/48, p. 19; 4/17/48, p. 243*). N

1949 | DNA
DNA is identified "positively" as the constituent of genes (*2/5/49, p. 83*).

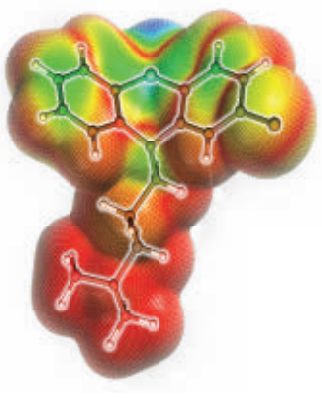
CLOCKWISE FROM TOP: LAWRENCE BERKELEY NATIONAL LAB/FLICKR; BELL LABS; U.S. ARMY/WIKIMEDIA; PHILIPPE WOJAZER/AFP/GETTY IMAGES

1950s

1950 | Animal antibiotics
Lederle Laboratories scientists show that lacing animal feed with trace amounts of the antibiotic aureomycin can boost the growth of livestock (*4/22/50, p. 243*).

1951 | Polio virus
Harvard scientists use polio virus grown in a test tube to vaccinate mice, a key step in developing a vaccine for people (*9/8/51, p. 147*). N

1951 | Cholesterol
Physicians link atherosclerosis to the circulation of large fatty particles in the blood and suggest that a low-cholesterol diet could prevent the condition (*6/16/51, p. 371*).



1953 | Double helix
James Watson and Francis Crick present their discovery of the double-helix structure of DNA (*12/19/53, p. 387*). N

1954 | New sedative
Chlorpromazine (top), developed to treat nausea and vomiting, may help sedate mental patients (*4/3/54, p. 213; 6/19/54, p. 387*).

1954 | Neutrino found
Frederick Reines and Clyde Cowan Jr. report experimental detection of the long-sought neutrino (*2/13/54, p. 99*). N

1955 | Smoke effects
Physicians report that smoking harms the heart (*2/26/55, p. 133*).

1955 | Tracking particles
Donald Glaser reports on the first photographs taken with his new bubble chamber, a tool for recording collisions of subatomic particles (*2/5/55, p. 87*). N

1956 | Steroids made
Scientists show how living things manufacture steroids, suggesting ways to block cholesterol formation (*12/8/56, p. 355*).

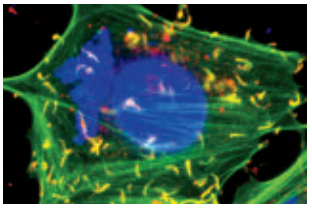
1957 | Particle mismatch
Physicists disprove the conservation of parity, establishing that some left- and right-handed subatomic particles do not behave identically (*1/26/57, p. 51*). N

1957 | Sputnik
The Soviet Union sends up Sputnik 1 (*10/19/57, p. 243, 244, 245; 12/7/57, p. 358*). Soon after, Sputnik 2 is launched with a dog (below) on board (*11/9/57, p. 292*).

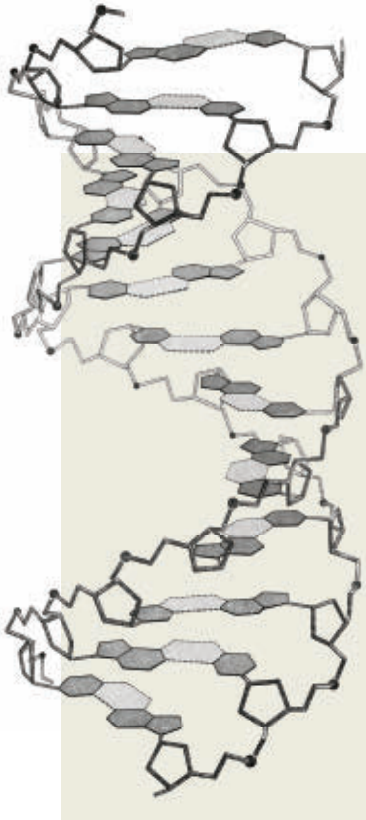
1958 | Explorer satellites
The United States launches its first satellite, Explorer 1, on January 31 (*2/8/58, p. 87*); another (Explorer 3) finds a mysterious high-radiation environment 660 miles up (*5/10/58, p. 291*).

1958 | Diabetes types
Henry Dolger reports that diabetes is really two diseases: type 1 with little or no insulin made, and type 2 in which the body doesn't use insulin well (*4/26/58, p. 265*).

1959 | Virus reproduction
A team reports that a virus can hijack a cell's machinery for reproduction (below), suggesting new ways to make vaccines (*5/2/59, p. 275*) .



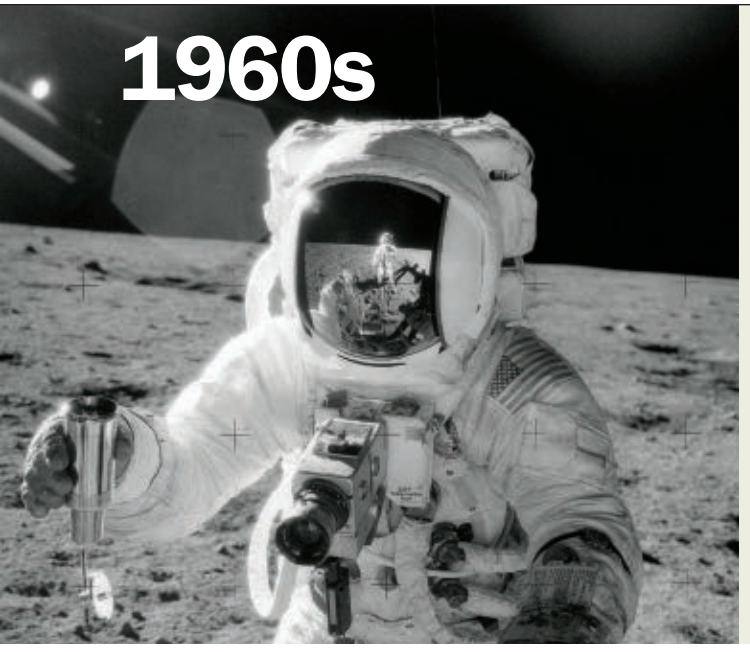
CLOCKWISE FROM TOP: PASIEKA/PHOTO RESEARCHERS, INC.; AFP/STRINGER/GETTY IMAGES; DR. DAN KALMAN/PHOTO RESEARCHERS, INC.; SCIENCE SOURCE



Double helix discovered

In 1953, the discovery of DNA's structure topped *Science News Letter*'s top 10 stories of the year, beating out the polio vaccine and the "successful climbing of Mt. Everest." The finding was not an instant hit, though; the initial April report in *Nature* of DNA's double helix drew little notice from reporters. Perhaps it didn't help that the research paper began with one of science's most famous understatements: "This structure has novel features which are of considerable biological interest." *Science News Letter* announced the discovery on December 19, just in time to make the news of the year. The article added its own understatement, noting that the structure "is creating about as much interest and hopeful speculation in chemistry and biology as anything that has happened in many months" (*12/19/53, p. 387*). Watson and Crick won a Nobel Prize in 1962 with Maurice Wilkins for their work, which helped lay the foundation for molecular biology and the manipulation of genes. —*Erika Engelhaupt*

1960s



Race to the moon

Science News Letter did its best to downplay the Soviet Union's achievement in launching Sputnik in 1957. "Our rocket scientists have been perfecting … their satellites, instead of concentrating upon scoring a 'first,' " a reporter wrote that year (*10/19/57, p. 243*). Ongoing Russian victories became hard to swallow during the space race of the 1960s. When cosmonaut Yuri Gagarin became the first man in space, one politician said the United States needed "space enthusiasts who are willing to take some risks" (*4/22/61, p. 243*). The magazine also tracked celebrations, such as when the United States had "practically overtaken" the Soviet Union in 1965 (*6/19/65, p. 387*), and lamented setbacks like the deaths of three astronauts in 1967 (*2/4/67, p. 112*). Though predicted "moon mines" and "space factories" never became a reality, the American flag planted on the moon in 1969 became a banner for a U.S. space program that still makes headlines today. — *Devin Powell*

1959 | Nutcracker Man
In East Africa, Louis Leakey excavates the skull of the oldest known hominid at the time, *Zinjanthropus boisei*, now called *Paranthropus boisei* (*12/5/59, p. 379*).

1960 | Laser
Theodore Maiman demonstrates the first optical maser, or laser (*4/23/60, p. 259*).

1960 | Marrow transplant
Physicians report successfully transplanting bone marrow from one woman to another with Hodgkin's-like disease (*1/23/60, p. 54*).

1961 | Cosmonaut
Yuri Gagarin of the Soviet Union becomes the first human to orbit the Earth (*4/22/61, p. 243*).

1963 | Cancer screening
Mammography is shown to be a valuable gauge of the presence of breast tumors (*3/23/63, p. 184*).

1963 | EM pulse
Military tests show that a high-altitude atomic bomb detonation could unleash a broad electromagnetic pulse that would disrupt all electronics (*11/9/63, p. 293*).

1964 | Quarks
Murray Gell-Mann and George Zweig independently propose the existence of quarks — fractionally charged particles within protons and neutrons (*4/25/64, p. 261*). N

1964 | Quasars
Astronomers describe 12 strange celestial objects that appear sometimes starlike and sometimes galaxy-like as quasars, for quasi-stellar objects (*5/9/64, p. 297*).

1965 | Antibiotic resistance
Doctors report that *Staphylococcus* bacteria are becoming resistant to antibiotics (*1/30/65, p. 69*).

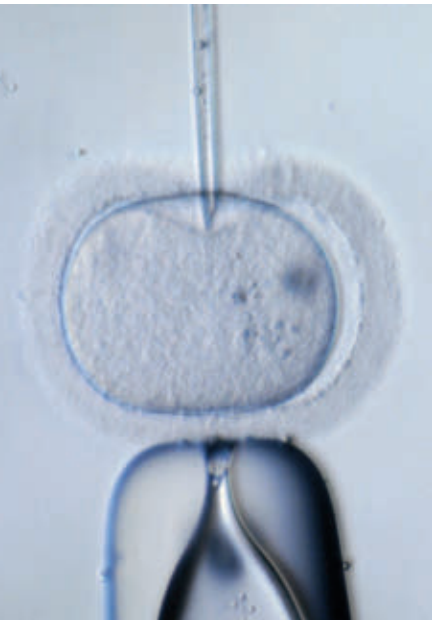
The future's so bright

The science writing of the 1950s and '60s reflected an Atomic Age optimism that technology could solve nearly any problem. Some of the ideas of the time foresaw a future that never quite came to fruition.

- **1957** Engineer Richard Whitcomb predicts that in 10 years, commercial planes "should be able to fly approximately 3,000 miles at about 1,000 miles per hour" (*3/23/57, p. 179*). In 1958, reports claim that "by 1966 at the latest, the air traveler will fly commercially from Los Angeles to New York in under two hours" (*6/14/58, p. 378*).
- **1966** People could travel even faster through "mole-hole tunnels," moving between any two cities in 42 minutes by essentially "falling" through a frictionless tube to the new locale, a Sylvania Electronic Systems scientist calculates (*2/19/66, p. 117*).
- **1955** "Atomic plants do not pose the 'disposal' problem that many laymen often think.… Fifty years would perhaps be the right time to let the hottest radiations die away" (*8/27/55, p. 131*).
- **1958** Scientists suggest they have "outguessed rust diseases that could attack wheat for the next 100 years" (*5/31/58, p. 341*). *Science News* still has coverage (above) of these pernicious fungi (*9/25/10, p. 22*). — *Erika Engelhaupt*

TOP: NASA

1960s



1966 | Moon landing
The Soviet Luna 9 spacecraft makes the first soft landing on the moon (*2/19/66, p. 114*).

1967 | Heart transplant
Christiaan Barnard in Cape Town, South Africa, transplants a human heart into Louis Washkansky (*12/16/67, p. 581; 1/6/68, p. 8*).

1967 | Pulsar
The first pulsar — stellar objects emitting beams of radiation that look from Earth like pulses — is discovered (*3/16/68, p. 255; 8/3/68, p. 114; 10/12/68, p. 362*). N

1969 | Man on moon
Apollo 11 astronauts Neil Armstrong and Buzz Aldrin walk on the moon (*7/26/69, p. 71, 72, 75*).

1969 | In vitro fertilization
Scientists report for the first time test-tube fertilization (shown above) of human eggs (*3/1/69, p. 209*). N

1970s

1970 | Atomic head shot
Using an electron microscope, physicist Albert Crewe takes the first photographs of individual atoms (*5/30/70, p. 524*).

1971 | Gene transfer
Scientists successfully transfer genetic information from one animal cell to another, correcting a genetic deficiency (*3/20/71, p. 193*).

1971 | DDT ousted
William Ruckelshaus, Environmental Protection Agency administrator, announces the cancellation of all uses of DDT (spraying shown below) in the United States (*1/23/71, p. 63*).

1971 | Mars view
Mariner 9 orbits Mars, sending home pictures of a global dust storm (*11/20/71, p. 339*).

1972 | Nerve cells
MIT biophysicists propose that nerve cell membranes build up electrical charges using protein channels as gates for sodium ions (*7/1/72, p. 14*).

Engineering genes

In the 1970s, genetic engineering feats started to come rapid-fire. Scientists were swapping genes between cells (*3/20/71, p. 193*), making synthetic copies of genes that could function in living creatures (*9/1/73, p. 132*) and learning to cut and paste genes using chemical scissors called restriction enzymes (*3/20/76, p. 188*). This quick progress raised hopes of new, better medicines, but also created fears of Frankenbugs escaping laboratories and introducing unstoppable diseases. In the face of growing alarm, scientists met at a seaside California resort in 1975 to agree on how to rein in their own research (right, ideas for creating safer engineered organisms). A *Science News* editor was there, detailing "this quiet piece of history" (*3/8/75, p. 148*). The next year, the U.S. National Institutes of Health issued formal guidelines on recombining genetic materials. Any slowdown was minimal, though, and in 1977 commercial genetic engineering got a boost when the U.S. Court of Customs and Patent Appeals ruled that companies could patent engineered microorganisms (*10/15/77, p. 247*). — *Erika Engelhaupt*

1972 | Black hole sign
Studies of radio emissions from Cygnus X-1 support claims that it is a black hole (*9/23/72, p. 197*).

1973 | CT scans
Godfrey Hounsfield reports the use of computed tomography scanning to create cross-sectional X-ray images of body tissues (*9/1/73, p. 134*). N

1973 | Synthetic gene
MIT scientists report the first synthesis of a gene with the potential to function detectably within a living cell (*9/1/73, p. 132*).

1974 | Ozone hole
Researchers report evidence that Freon and other chlorofluorocarbons destroy stratospheric ozone (*9/21/74, p. 180; 10/5/74, p. 212*). N

1974 | J/psi particle
Two teams find a new subatomic particle, now known as the J/psi, providing evidence for the existence of the charmed quark (*11/23/74, p. 324; 11/30/74, p. 340; 1/25/75, p. 58*). N

1975 | Genetics limits
At a conference at Asilomar in California, scientists for the first time develop rules restricting investigations in the nascent field of genetic

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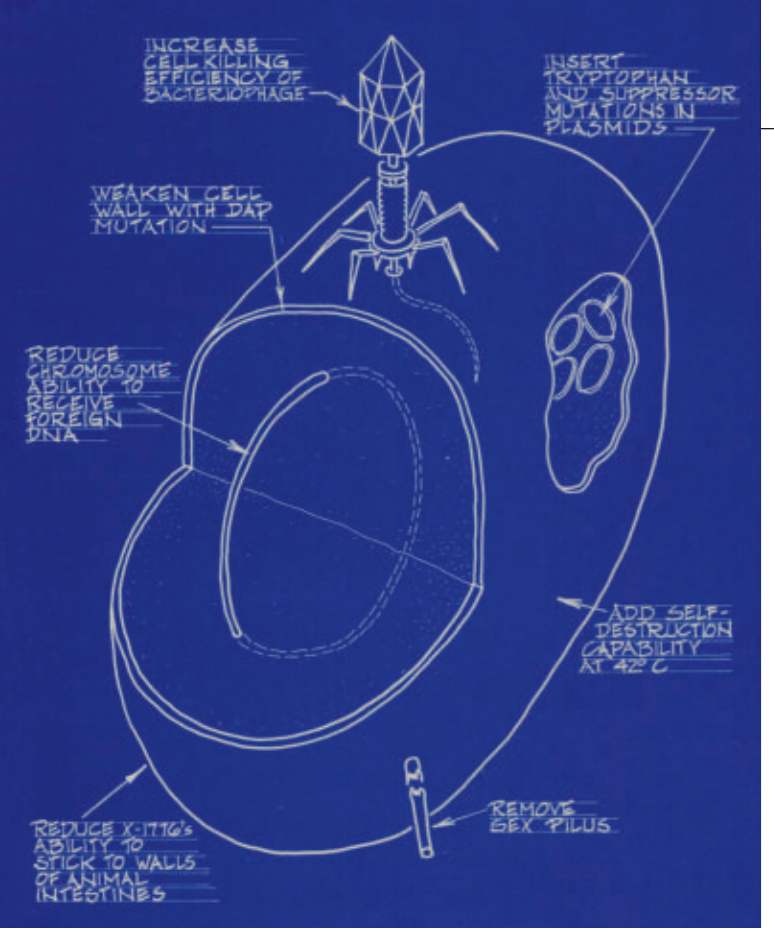


engineering (*3/8/75, p. 148*; *3/22/75, p. 194*; *6/7/75, p. 366*; *12/13/75, p. 372*).

1975 | Lucy found
Donald C. Johanson and his team report finding the partial skeleton of a human ancestor more than 3 million years old, nicknamed Lucy (*1/4/75, p. 4*).

1977 | Bottom quark
Leon Lederman and colleagues report evidence of a new quark, the bottom quark, in experiments at Fermilab (*8/13/77, p. 100*; *8/6/78, p. 87*).

1978 | In vitro baby
The world's first test-tube baby is born in England (*7/22/78, p. 51*; *9/23/78, p. 212*; *12/9/78, p. 407*).

1978 | Primate talk
Two chimps exhibit "the first instance of symbolic communication between nonhuman primates" (*8/19/78, p. 117*). Koko (left), a "talking" gorilla, is reported to have a sign language vocabulary of 375 words (*10/14/78, p. 265*).

1979 | Nuclear meltdown
The Three Mile Island nuclear power plant experiences a catastrophic accident (*4/7/79, p. 227*; *5/5/79, p. 292*; *7/21/79, p. 45*; *11/3/79, p. 309*; *12/15/79, p. 405*).

Prescient prognostications

Science News has reliably covered most of the biggest science stories of the last 90 years. But also tucked away in the magazine's pages have been many signs that *SN* reporters were on to something before it was mainstream.

- **1936** Women may one day borrow an egg from another woman, have the egg fertilized in a test tube and then incubate the egg in their own wombs (*4/11/36, p. 228*).
- **1943** Water hyacinth (below) is becoming a serious river pest in the United States (*2/13/43, p. 102*). In 1968, *SN* writes that the plant "now clogs waterways of southern states and costs millions a year in dredging bills" (*10/26/68, p. 423*).
- **1943** A dream refrigerator is envisioned that will open its doors at the touch of a switch, dispense cool water, make ice cubes automatically and have a separate freezer—one that even defrosts itself (*3/27/43, p. 198*).
- **1956** Weather forecasts may soon start coming with probability estimates for the predictions, such as "a 60 percent chance of rain" (*5/19/56, p. 307*).
- **1957** A new field called gnotobiotics, "the study of animals in a germ-free or germ-controlled environment," is described (*1/26/57, p. 62*). Today, gnotobiotic animals are used in labs around the world (*6/18/11, p. 26*). —*Erika Engelhaupt*

CLOCKWISE FROM TOP LEFT: VOLKER ZINSER; PETER CHADWICK/GETTY IMAGES; AP PHOTO/GORILLA FOUNDATION

1980s

1980 | Mount St. Helens
Mount St. Helens (above) erupts, killing nearly 60 and destroying 150 square miles of the surrounding landscape (*4/5/80, p. 213*; *4/12/80, p. 229*; *5/3/80, p. 277*; *5/24/80, p. 324*; *6/7/80, p. 355*; *7/26/80, p. 58*; *8/16/80, p. 101*).

1980 | Toxic shock
Federal scientists suspect that staph bacteria linked to tampon use are causing a puzzling increase in toxic shock syndrome (*9/27/80, p. 198*; *10/18/80, p. 247*).

1981 | Ozone hole
NASA reports satellite evidence that the stratospheric ozone layer is being depleted globally (*8/22/81, p. 116*).

1981 | AIDS detected
An outbreak of two rare and serious diseases among homosexual men — Kaposi's sarcoma and *Pneumocystis* pneumonia — mark the discovery of what would come to be known as AIDS (*11/14/81, p. 309*).

1982 | Ribozyme
Thomas Cech and colleagues report that RNA can function like an enzyme to trigger the synthesis of proteins (*11/27/82, p. 342*). N

1982 | Artificial heart
Surgeons successfully implant the first permanent artificial heart into a human (*12/11/82, p. 372*; *12/18–25/82, p. 388*).

1983 | Exodisk
Astronomers detect evidence for solid material around the star Vega, a sign of possible exoplanets (*8/13/83, p. 100*; *8/20/83, p. 110*; *11/19/83, p. 324*).

1984 | Brown dwarf
Astronomers for the first time think they have evidence of a brown dwarf — a celestial object too big to be a planet but insufficiently massive to become a star (*12/15/84, p. 373*).

1985 | GMOs
U.S. federal agencies approve the first two experimental releases of genetically modified organisms: antifrost bacteria for strawberries and tumor-resistant tobacco plants (*11/23/85, p. 324*).

1985 | Buckyballs
Chemists identify a soccer-ball–shaped configuration of carbon atoms, nicknamed a buckyball (*11/23/85, p. 325*). N

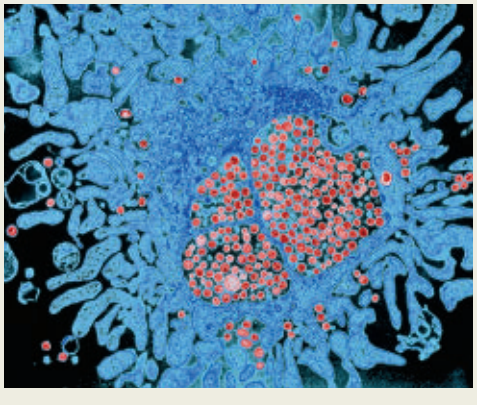
1986 | Chernobyl
An explosion triggers a meltdown at the Chernobyl nuclear power plant (below) in Ukraine (*5/3/86, p. 276*; *5/10/86, p. 292*; *5/17/86, p. 308*; *5/24/86, p. 326*; *8/30/86, p. 135*).

1986 | Shuttle explosion
The space shuttle *Challenger* explodes, killing all seven crew members, including a high school teacher (*2/1/86, p. 68*; *2/8/86, p. 85*).

1987 | Ozone protection
The Montreal Protocol to phase out stratospheric

Chasing the AIDS virus

In 1981 a short story in *Science News* noted an uptick in a rare form of cancer and pneumonia in gay men (*11/14/81, p. 309*). The cause of what the story called a "puzzling outbreak," the human immunodeficiency virus (below, reproducing inside a cell), wouldn't be named for another five years (*4/26/86, p. 265*). In the meantime, the scientific community struggled to link this virus to AIDS, facing "a grim picture of a disease that remains one step ahead of the researchers seeking ways to stop it" (*4/27/85, p. 260*). As the outbreak became an epidemic, *Science News* reported on the first copying of the virus's genetic blueprints and the first screening tests (*1/19/85, p. 36*). A breakthrough came in 1986 with the use of azidothymidine, or AZT. The drug, which promised to "prolong the lives of an estimated 600,000 people in the United States" (*8/26/89, p. 135*), helped make AIDS a treatable disease instead of a death sentence. — *Devin Powell*



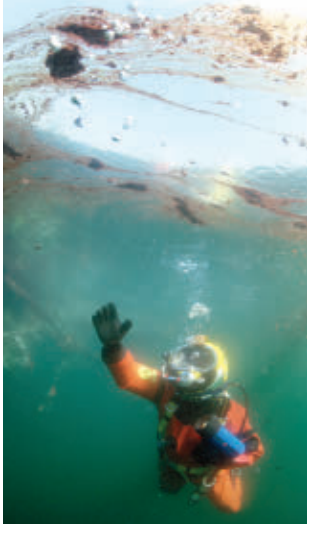
CLOCKWISE FROM TOP LEFT: ZOLTAN GAAL/PHOTO RESEARCHERS, INC.; © IGOR KOSTIN/SYGMA/CORBIS; HANS GELDERBLOM/GETTY IMAGES

1990s

ozone-destroying chlorofluorocarbons gets enough signatures; it goes into effect January 1, 1989 (*9/26/87, p. 196*; *11/19/88, p. 333*).

1987 | Dino wipeout
Grains of shocked quartz from around the world offer further evidence that a meteorite or asteroid struck the Earth more than 65 million years ago, causing mass extinctions of life — including dinosaurs (*5/16/87, p. 309*).

1989 | *Exxon Valdez*
A tanker accident dumps more than 11 million gallons of crude oil (slick below) in Alaska's Prince William Sound (*6/17/89, p. 383*; *7/15/89, p. 38*).



1989 | Cold fusion
Martin Fleischmann and B. Stanley Pons report on benchtop nuclear reactions that they describe as "cold fusion" but that are never confirmed (*4/1/89, p. 196*; *4/8/89, p. 212*; *4/15/89, p. 229*; *4/22/89, p. 244*).

1990 | Hubble
NASA launches the Hubble Space Telescope (*1/6/90, p. 8*; *5/5/90, p. 276*; *6/30/90, p. 407*).

1991 | *H. pylori*
A series of research efforts compellingly link stomach ulcers to the *H. pylori* bacterium (*12/14/91, p. 399*). N

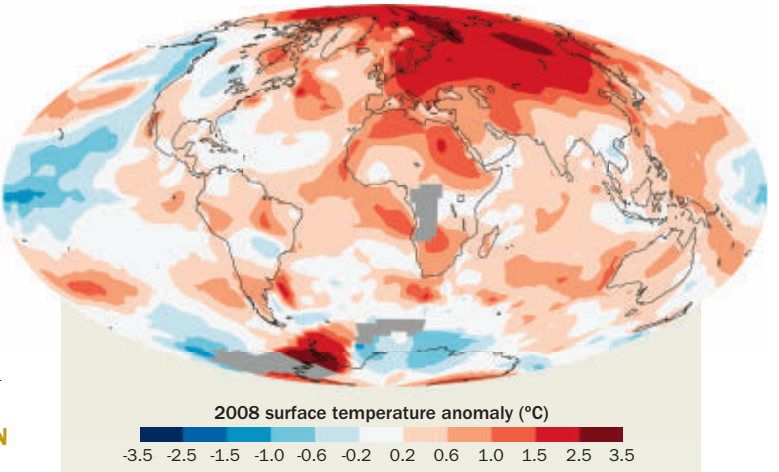
1992 | Big Bang signature
Cosmologists detect temperature fluctuations in the cosmic microwave background, variations that correspond to ripples in the density of matter shortly after the Big Bang (*5/2/92, p. 292*; *12/19–26/92, p. 420*). N

1992 | New brain cells
Neuroscientists discover that a protein can prompt mature nerve cells in adult mice to divide, dispelling the belief that adult mammals' brain cells cannot reproduce (*4/4/92, p. 212*).

1993 | Dark Milky Way
Astronomers report evidence of Massive Compact Halo Objects at the outskirts of the Milky Way (*9/25/93, p. 199*). These MACHOs account for part of the universe's missing mass.

1993 | Human cloning
Scientists for the first time clone human embryos, raising a host of ethical questions (*10/30/93, p. 276*).

1994 | Black hole
Astronomers report the most compelling evidence for the existence of a black hole at the center of galaxy M87, 50 million light-years from Earth (*6/4/94, p. 356*).



Climate in flux

More than half a century ago, temperature records from Antarctica and the Arctic showed data "consistent with the theory that the entire world is slowly getting warmer," *Science News Letter* reported. This low-grade fever began around 1900 and was believed "to amount to some two or three degrees each century" (*2/28/59, p. 131*). But not until the 1990s would climate experts from around the world begin issuing consensus statements through the Intergovernmental Panel on Climate Change warning of catastrophic climate perturbations if humankind didn't put the brakes on releases of carbon dioxide and other greenhouse gases (*6/23/90, p. 391*) — preferably immediately (*11/4/95, p. 293*). As international agreements such as the 1997 Kyoto Protocol have largely failed in that task, scientists have expanded efforts to chronicle the world's shifting climate (above, 2008 temperatures compared with 1950–1980 baseline period) and ecosystems (*SN Online: 12/2/11*). — *Janet Raloff*

1994 | Breast cancer genes
A pair of genes, *BRCA1* and *BRCA2*, appear to play a role in some inherited breast cancers (*9/24/94, p. 197*; *12/3/94, p. 372*).

1995 | Climate changing
The Intergovernmental Panel on Climate Change finds evidence of a discernible human influence on climate (*11/4/95, p. 293*).

1996 | Oldest life
Carbon isotope measurements from Greenland rocks push back the history of life on Earth to 3.85 billion years ago (*11/9/96, p. 292*).

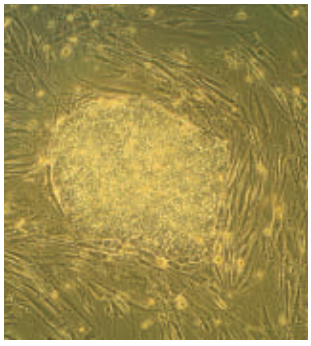
1996 | Dolly the Sheep
A sheep named Dolly (left) becomes the first mammal cloned from the DNA of an

CLOCKWISE FROM LEFT: FLIP NICKLIN/GETTY IMAGES; © NASA/CORBIS; GETTY IMAGES

1990s

adult animal (*3/1/97, p. 132*; *4/5/97, p. 214*; *10/20/01, p. 250*).

1997 | Stem cells
Biologists isolate human embryonic stem cells (embryonic stem cell line, below), which have the potential to become nerves, blood or any other tissue (*7/19/97, p. 36*).



1997 | Quantum teleport
Researchers harness quirks of quantum behavior to transfer one photon's polarization state to a remote photon (*1/17/98, p. 41*).

1998 | Speedier universe
Astronomers uncover data indicating that the expansion of the universe is picking up speed (*3/21/98, p. 185*; *10/31/98, p. 277*). N

1999 | HIV source
Genetic studies confirm that the AIDS virus originated in chimps living in central Africa (*2/6/99, p. 84*).

1999 | Cancer drug
Researchers report on a new drug, eventually trade named Gleevec, that shows promise in specifically targeting chronic myelogenous leukemia cells (*12/11/99, p. 372*).

2000s

2000 | Mars view
Analyses of images taken by NASA's Mars Global Surveyor spacecraft suggest that water may have recently gushed up from below the surface (*7/1/00, p. 5*).

2000 | Tau neutrino
Physicists provide the first direct evidence of the tau neutrino (*7/29/00, p. 68*).

2001 | Human genome
Two projects report deciphering the genetic blueprints of humans; although scientists had expected to find 100,000 genes, the efforts turn up only about one-third that many (*2/17/01, p. 100*).

2001 | Photon fixative
Physicists report getting light pulses to stand still, without destroying the photons (*1/27/01, p. 52*).

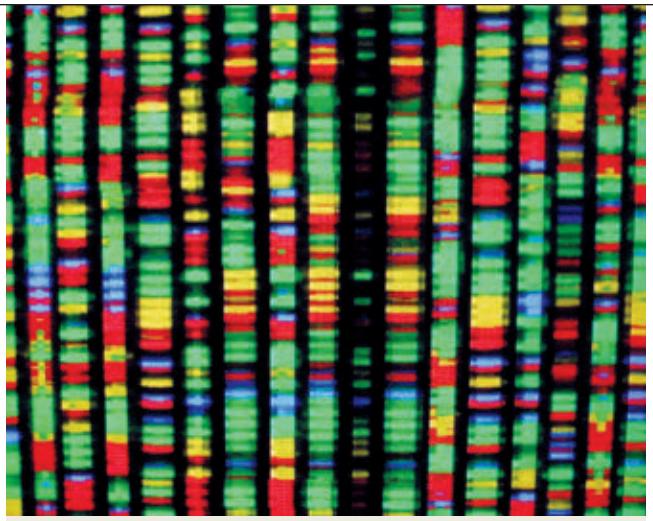
2002 | Early ancestor
Anthropologists working in Chad describe a fossil skull more than 6 million years old of *Sahelanthropus tchadensis*, which may be the oldest known human ancestral species (*7/13/02, p. 19*).

2002 | RNA rise
Researchers find increasing numbers of genes that contain instructions to make RNA rather than proteins (*1/12/02, p. 24*).

2002 | Age of universe
Astronomers put the age range of the universe at between 13 billion and 14 billion years (*5/4/02, p. 277*).

2003 | SARS fears
A deadly viral pneumonia that emerged in China (left), called SARS for severe acute respiratory syndrome, begins spreading around the globe (*3/29/03, p. 198*; *4/26/03, p. 262*).

2004 | Hobbits
Remains of a small human-like species that lived as late as 18,000 years ago, nicknamed hobbits, are reported



Reading genomes

When a private company and a government project both published the genetic instruction book for human beings in 2001, the text was "as striking for what we don't see as for what we do," *Science News* reported (*2/17/01, p. 100*). Only a third as many genes were found as had been expected (color-coded DNA analysis shown). Upon closer readings over the last decade, the surprises kept coming. Scientists have shown that different individuals have "much more human genetic variation than scientists had expected" (*9/8/07, p. 147*) and discovered that tiny snippets of RNA keep cells healthy. Frisky Neandertals may have even left "a little relic of the Stone Age in [human] DNA" (*6/5/10, p. 5*). But as the list of people and other creatures whose genetic blueprints have been deciphered grows, fundamental questions remain — including precisely how many genes people have ("no one really knows") and which ones actually do something important (*11/6/10, p. 5*). — *Devin Powell*

CLOCKWISE FROM LEFT: RYDDRAGYN/WIKIMEDIA; MARIO TAMA/GETTY IMAGES; EUGENE HOSHIKO/ASSOCIATED PRESS

on the Indonesian island of Flores (*10/30/04, p. 275*).

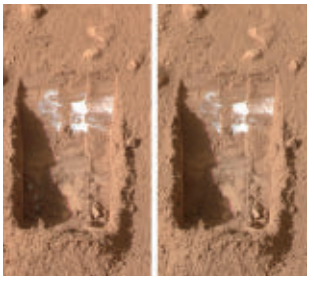
2005 | Quark-gluon plasma
Physicists create a quark-gluon plasma, the primordial matter of the young universe; surprisingly, it is a liquid, not a gas (*4/23/05, p. 259*).

2006 | Pluto demoted
After a rancorous debate, astronomers vote to take away Pluto's planetary status (*8/19/06, p. 115; 9/2/06, p. 149*).

2006 | Dark matter
Researchers report direct detection of dark matter's presence in space (*8/26/06, p. 131*).

2007 | Cell switcheroo
Biologists turn human skin cells into stem cells, without embryos (*11/24/07, p. 323*).

2008 | Mars water
A Mars lander (tracks below) definitively confirms the presence of water on Mars, after the rover "touched and tasted ice" (*8/30/08, p. 11*).



2009 | MicroRNAs
A tumor suppressor protein turns out to have a previously unrecognized function: helping to slice stretches of RNA into regulatory molecules called microRNAs (*8/15/09, p. 8*).

2009 | All about Ardi
A 4.4-million-year-old partial female skeleton found in Africa offers the closest look yet at *Ardipithecus ramidus*, right (*10/24/09, p. 9*).

2010 | BP oil spill
The biggest oil spill in the history of the United States dumps a mixture of crude oil and natural gas into the Gulf of Mexico for five months (*7/3/10, p. 5; 9/11/10, p. 5; 10/9/10, p. 10*).

2010 | Neandertal liaisons
A project sequencing the Neandertal genetic instruction book turns up evidence of prehistoric interbreeding between that species and humans (*6/5/10, p. 5*).

2011 | Tohoku-oki quake
A magnitude 9.0 earthquake in Japan and the tsunami it spawned kill more than 15,000 people and trigger the worst nuclear disaster since Chernobyl (*4/9/11, p. 5*).

2011 | Sea level rise
North Carolina sediment cores reveal that sea levels began rising precipitously in the late 19th century, a trend attributed to climate change (*7/16/11, p. 13*).

Ninety years of spreading the science news

Through the years, *Science News* has found a range of creative ways to bring the latest discoveries of science to the public.

- **1932** *SNL* offers "an experimental series of science addresses recorded phonographically by eminent scientists" on long-playing records (*2/20/32, p. 112*). A set of seven records with pictures of the speakers sells for $3 postage paid (*3/5/32, p. 148*).
- **1943** An overseas pocket-sized edition of *Science News Letter* ships out to troops during World War II (*11/20/43*).
- **1954** A monthly edition of *SNL* is offered to carry "the news of science to the non-English speaking areas of the world." Called *Scientia International*, the magazine is printed in an "international auxiliary language" called Interlingua (akin to Esperanto): "In other countries there is no journal like *Science News Letter*. But now you can supply them with one in a language which is not their native tongue but which they can read with utter ease" (*2/20/54, p. 125*).
- **1969** *SN* announces the publication of an annual review called *Science News Yearbook*, as well as having doubled its staff and added foreign correspondents "from Canberra to New Delhi to Geneva" (*1/18/69, p. 59*).
- **2011** *Science News Prime*, an interactive tablet publication for the iPad (right), goes on sale in the iTunes app store.

— Erika Engelhaupt

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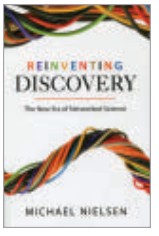
Reinventing Discovery: The New Era of Networked Science

Michael Nielsen

The most common edit to a Wikipedia article changes only a single line of text. The same is true for Linux, the open-source computer operating system: A typical contribution changes just one line of code. Such "microcontributions" are one way to bring more expertise to any enterprise, argues Nielsen, a physicist. And by using such approaches to make all of science open and collaborative — through online sharing of data, methods and problems — the rate of discovery will ramp up too.

Nielsen's book is a thorough primer on what he calls "networked science." Some researchers are already harnessing collective intelligence. More than 200,000 people have helped astronomers classify celestial objects through the Galaxy Zoo project, and video game players are helping biologists uncover how particular proteins fold. We are in the midst of a revolution, Nielsen argues, in which networked science can solve problems at the limit of human understanding — and may even change the world.

That claim may sound over the top, but Nielsen makes a compelling case in this self-described manifesto. With friendly, engaging writing, he describes specific approaches and characteristics that can make collaborations truly bloom. Obstacles still loom — namely a scientific establishment where success in publishing and getting grants is achieved more often through secrecy than sharing. But that's changing, says Nielsen. Some funding agencies, for example, require that scientists share their data. And as more people read this book, perhaps change will come faster. — *Rachel Ehrenberg*



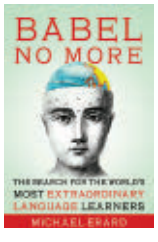
Princeton Univ., 2012, 264 p., $24.95

Babel No More

Michael Erard

Some people speak several languages — lots of people, actually. But imagine understanding 15 or 30. That's rare company, and Erard finds such people irresistible. He explores the world of "hyperpolyglots," superlearners who test the upper limits of language abilities.

The book covers a lot of territory: hypotheses about how specific brain developments might contribute to making a hyperpolyglot, communities where it is common to speak three to five languages, language learning in youth and a brief history of India's hundreds of languages.



But the real payoff comes from anecdotes of lingual feats. Erard starts with Cardinal Mezzofanti, a 19th century Italian who spoke dozens of languages — some say 30 proficiently — and who could become conversational in any language on two weeks' notice.

Erard tracks down an 89-year-old hyperpolyglot in Sweden who attributes it all to a photographic memory. But before their correspondence can progress, the old man dies. Erard then finds a middle-aged hyperpolyglot in California who is studying close to 60 languages and has "real reading knowledge" in 20. But he's never spoken most of them.

These and other superlearners form a small fraternity, mostly men, and there is no clear path to joining it. Some hyperpolyglots use flash cards, others just work hard. Some concentrate on the hardest parts — the verbs in Arabic or prefixes in Swahili. Even then learning one new language can block out another.

But feel free to ignore rules, said Lomb Kató, a Hungarian who died in 2003 with at least 17 languages under her belt. "One learns grammar from language, not language from grammar," she said. Erard quips, "One can almost hear the thousands of language teachers gnashing their teeth in Hungary's direction." — *Nathan Seppa*

Free Press, 2012, 320 p., $25.99

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L. Douglas Keeney

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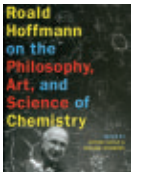

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Pondering speedy neutrinos

Regarding "Hints of a flaw in special relativity" (*SN: 10/22/11, p. 18*), there could be a simple explanation for neutrinos being measured as traveling faster than the speed of light in a vacuum. While a vacuum is typically defined as a space entirely devoid of matter, in fact a vacuum is a busy medium with virtual particles continually being created and destroyed. Light passing through a vacuum is affected by such activity.

Neutrinos have such low interactions that they can pass through a lead wall several hundred light-years thick without slowing down. The ultimate speed in the universe is, therefore, that of neutrinos, not photons in a vacuum. It isn't so much that neutrinos are faster than light in a vacuum, rather that light is slower than neutrinos whether or not the neutrinos are in a vacuum.

As for special relativity, it relies on the constancy of the speed of light, not on any particular speed of light. Substituting the speed of neutrinos would not affect the measurable results.

Robert Berliner, Los Angeles, Calif.

Such interactions in a vacuum do slow light down, a phenomenon called the Scharnhorst effect. But this effect is much too insignificant to explain how neutrinos could arrive at a detector 60 nanoseconds earlier than light in a race covering only 730 kilometers. That 60 nanoseconds corresponds to a margin of victory in that race of about 18 meters. A photon slowed by the Scharnhorst effect would lag behind a photon without such a slowdown by only about the width of an atom — after racing for the current age of the universe. — Tom Siegfried

While it seems unlikely the faster-than-light neutrinos are really that fast, it is important to find the cause of the experimental error (if there was an error). Scientific revolutions are the result of years of ignoring data that "don't fit" until finally the burden of outlier data accumulates enough that someone questions existing paradigms. So while the editorial "With scientific puzzles, all the pieces have to fit" (*SN: 1/28/12, p. 2*) was mostly excellent, I object strongly to the final phrase, "if it doesn't fit, you must omit." Rather, "if it doesn't fit, you must understand *why*." Even if the outlier data were in error, understanding the cause will improve future experiments. And you never know, maybe it really shouldn't have fit!

Al Bogart, Framingham, Mass.

I am in complete agreement with the reader. I should have stressed that "if it doesn't fit, you must omit" is just a general rule. The rare exceptions are the source of exciting scientific advances, requiring the creation of a whole new puzzle. — Tom Siegfried

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From the Archive

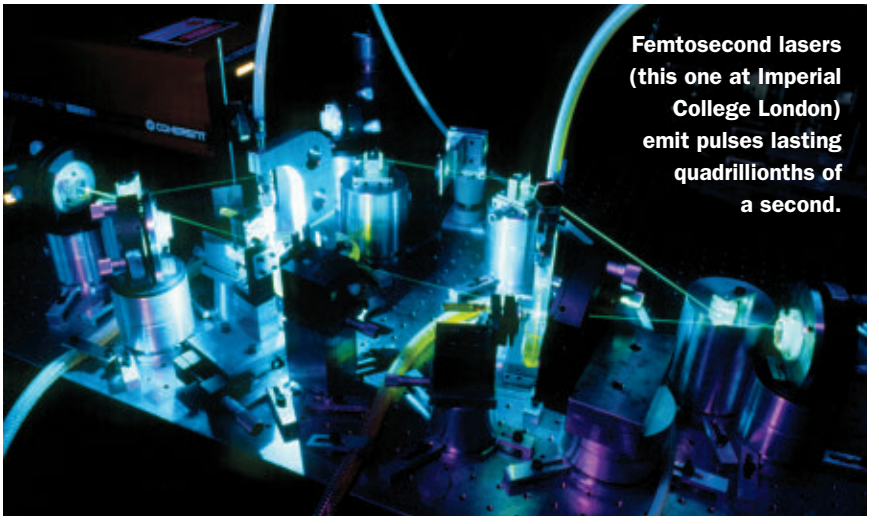
Three-inch pieces of light

A method of cutting off three-inch pieces from a beam of light, like a meat cutter slicing a bologna sausage, though the light moves at 186,000 miles a second, is described by Dr. Ernest O. Lawrence and Dr. J. W. Beams of Yale University.

Though light travels so fast that it can encircle the earth seven times in a second, the two physicists made use of a shutter that turned the light on and off with such rapidity that each "piece" of light was only about three inches in length. Each flash lasted a hundred billionth of a second.

The investigation was undertaken in an endeavor to measure the length of what are called "quanta" of light, for according to modern ideas, light is transmitted as separate pulses, each of which is called a quantum. Physicists have been uncertain as to how long these quanta are, but by some it was believed that they were as much as a yard in length.

These extremely short flashes of light were measured by a very delicate photoelectric cell, which gives off an electric current when illuminated, and they found that so long as the total amount of light reaching the cell was the same, the resulting current was not affected by the length of the individual flashes. One three inches long produced an effect as well as a piece of light many miles or more in length, and this shows, say the investigators, that the individual quanta are less than three inches in length.



Femtosecond lasers (this one at Imperial College London) emit pulses lasting quadrillionths of a second.

LASER: DEPT. OF PHYSICS, IMPERIAL COLLEGE LONDON/PHOTO RESEARCHERS, INC.; PAPER: PAPHIA/ISTOCKPHOTO

UPDATE

Photon size a trickier question today

Thanks to the advent of the laser and an optical technique called mode-locking, today researchers can readily generate light pulses in the femtosecond range, one ten-thousandth the duration of the briefest beat made by Ernest Lawrence and J.W. Beams in 1927. A handful of teams around the world even have their sights set on an attosecond pulse, which would flash every billionth of a billionth of a second (*SN: 3/27/10, p. 16*).

But this apparent carving up of light into smaller pieces doesn't mean that the photon's size has shrunk, for at least two reasons. The simplest: Laser pulses contain many photons, not just one. And the deeper, more bewildering: The photon is not what it was once thought to be.

When Lawrence and Beams chopped up light, quantum mechanics was in its infancy; the work of Schrödinger, Heisenberg and Dirac had not finished rocking the very foundations of physics. More than eight decades on, researchers see (if not crystal clearly) that until a definite question is asked, and the experimental setup specified, there is no definite answer to how big a photon is. Until it's measured, a photon is any size.

Nobel laureate Anthony Leggett of the University of Illinois at Urbana-Champaign suggests a specific way to pose the question, one that's not too far from Lawrence and Beams' original approach: "What is the extent of the photon wave packet as it is emitted from the atom?" Multiplying the lifetime of the excited atom by the speed of light gives an answer of around a meter.

But the quantum world is one of probabilities. Within that meter, there's a nearly 100 percent probability of getting the photon. Still, there's some smaller probability that the photon shows up in Lawrence and Beams' 3-inch chunk too. —*Elizabeth Quill*

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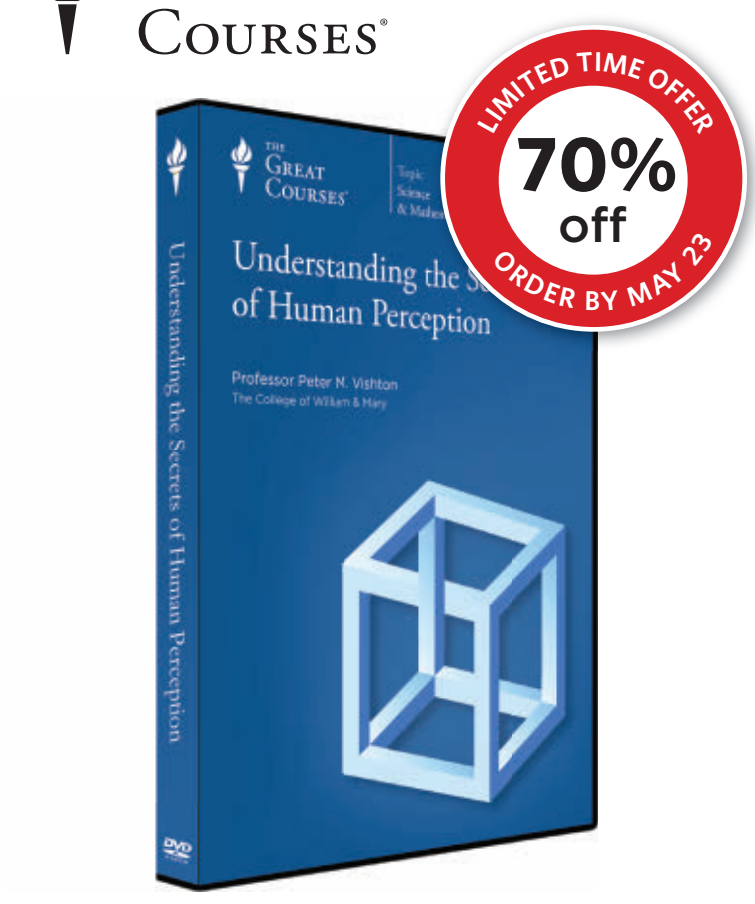

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