SCIENCE NEWS of the Year

This is a review of important science news stories of 1988 as reported in the pages of SCIENCE NEWS. *The references after each item refer to the volume and page number in which the main article on the subject appeared in* SCIENCE NEWS *(Vol. 133 is Jan.-June; Vol. 134 is July-Dec.). Where several references exist, the news developed and was reported in more than one issue. Back issues or, when out of stock, copies of articles are available for one dollar each by writing to* SCIENCE NEWS, *1719 N Street, N.W., Washington, D.C. 20036.*

1988

Anthropology

• Analysis of bones from a 1.8-million-year-old African site suggested a line of now-extinct hominids were as capable of making and using tools as the earliest direct ancestors of modern humans (133:344).

• An unlooted, 1,500-year-old tomb of a warrior-priest from Peru's Moche culture yielded one of the richest collections of pre-Columbian artifacts ever found in the Americas (134:181).

• A South African cave yielded charred bones dating to between 1 million and 1.5 million years ago, providing the earliest direct evidence for the use of fire by hominids (134:372).

• The first undisturbed collection of artifacts belonging to the Clovis people, thought to have been early settlers of North America around 11,500 years ago, turned up in a Wenachee, Wash., apple orchard (133:261). Evidence on an island off the Alaskan coast suggested some of North America's first settlers arrived by boat and had an advanced maritime culture (133:164).

• Burnt flints from an Israeli cave indicated anatomically modern humans were living in the Middle East around 92,000 years ago – about 50,000 years earlier than previous estimates (133:138).

• Current theories of violence were challenged by a researcher who calculated one of the world's highest known homicide rates in a small New Guinea society (133:90).

• A team of scientists uncovered 2-million-year-old stone tools in Pakistan and contended early human ancestors inhabited parts of Asia and Africa simultaneously (134:7).

• Greek investigators uncovered what may be the first known remains of a Cretan pirate outpost. The man-made harbor dates to approximately 350 B.C. (134:325).

• Microscopic and chemical studies of Late Stone Age artifacts indicated an extensive plaster industry thrived in the Near East around 12,000 B.C. and used technology adapted for pottery making 6,000 years later (134:213).

• Excavations at an ancient Maya site in Belize supported the view that a small number of densely populated cities developed while Classic Maya society was beginning its collapse around A.D. 800 (134:165).

• Investigators found that modern hunter-gatherers engage in a surprising amount of scavenging at carnivore kill sites, thus supporting a theory that early human ancestors were avid scavengers (133:373).

1988

Astronomy

• Supernova 1987A, the nearest supernova explosion in modern times, continued to capture the attention of astronomers (133:5, 168; 134:40). Researchers detected the supernova's light echo (133:388) but couldn't find convincing evidence for a pulsar at its core (134:388).

• Giant luminous arcs turned out to be highly magnified images of distant, extremely faint galaxies (134:357).

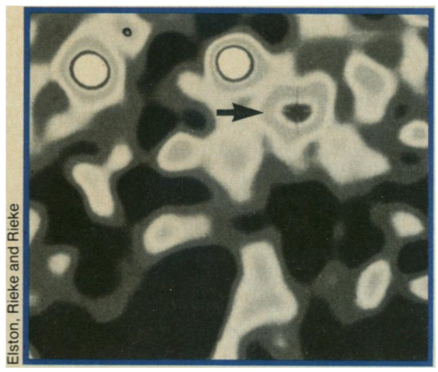
• Astronomers accumulated the best evidence yet that nearby stars are likely to have planet-sized companions (134:103).

• The discovery of a remarkable millisecond pulsar that appears to be destroying its companion (134:72) suggested a new place to look for dark matter (133:87; 134:374).

• An infrared survey covering several hundred galaxies revealed that elliptical galaxies contain interstellar gas, prompting a reevaluation of theories concerning their evolution (133:396).

• Astronomers were puzzled by bursts of mysterious, high-energy, neutral particles coming from a distant double star (134:276).

• Improvements in the sensitivity of imaging equipment allowed astronomers to peek at distant galaxies (shown below) in a very primitive stage of development (133:52; 134:92).



Elston, Rieke and Rieke

• The analysis of radio and optical observations of the galaxy M51 showed that a spiral galaxy's arms can directly trigger star formation (134:86).

• A new explanation for an unusually bright nova, which took place in 1975, accounted for many anomalies not adequately addressed by previous models (133:229).

• Astronomers identified the farthest known galaxy (133:262; 134:103) and the most distant supernova yet seen (134:219).

• Pictures of Comet Halley, then about 1,250 million kilometers from Earth, revealed the comet was still releasing dust (134:106).

• New observational work on young binary stars provided important clues on how binaries form (134:280).

1988

Behavior

• A team of scientists studying several large families located a specific region of chromosome 5 likely to contain a gene predisposing its bearers to schizophrenia. Another study found no relation between schizophrenia and the same chromosome 5 region (134:308).

• An antidepressant drug not approved for use in the United States significantly improved the condition of many people with obsessive-compulsive disorder (133:324).

• Anger, a sense of vigor and a determination to get on with life were linked to better immune function among homosexual men in the early stages of infection with the AIDS-causing virus (134:116).

• Schizophrenics followed for two years after release from a psychiatric hospital tended to benefit more by taking about one-fifth the standard dose of a commonly prescribed antipsychotic drug (134:196).

• A study of decisions made by psychiatric emergency-room clinicians suggested widespread commitment laws based on a person's dangerousness are working better than critics have charged (134:132).

• Investigators found that people who habitually explain bad events pessimistically in early adulthood have an increased risk of poor physical health by middle age (134:54).

• Researchers questioned whether several adoption and twin studies demonstrate that alcoholism is a genetic disease (134:74). Other scientists pursued studies of the expectations and motivations promoting alcohol abuse (134:88).

• A measure of creativity at work and in spare-time activities was higher among people who undergo mild mood swings as well as in healthy relatives of manic depressives (134:151).

• Mothers who worked part-time in the year after their baby's birth displayed less depression and a better relationship with the infant than did new mothers who stayed at home or worked full-time (134:220).

• Research on post-traumatic stress syndrome indicated a fundamental "splitting of the self" is at the root of the disorder (133:197). A survey of post-traumatic stress syndrome in the general population found it is uncommon, except among wounded Vietnam veterans (133:6).

• Scientists reported positron emission tomography (PET) images can identify seizure-producing tissue in the brain and aid in the selection of seizure patients for brain surgery (133:280).

• Upsetting the notion that there are permanent "flashbulb" memories, psychologists found that vivid memories associated with startling events are not always accurate or immune to forgetting (133:358).

1988

Biology

• Motivated by the need for animal models of AIDS, two research groups independently transplanted human immune-system cells into specially bred mice that lacked their own immune systems (134:198).

• Genetic engineers managed to insert a foreign gene into corn—the first monocot grain to yield to the technique (133:263). Coming technologically full-circle, chemical company researchers began using genetic engineering techniques to produce crops resistant to their own chemical pesticides (133:348; 134:300).

• Researchers continued to expand the applications of a powerful gene-amplification technique (133:262, 357). Its use on individual sperm cells showed great potential for gene-mapping studies (134:214).

• Researchers cloned an area on the Y chromosome containing the testis-determining-factor gene, which they say is responsible for at least the first step in what makes humans male or female (133:4).

• Scientists elucidated details of tRNA's role in genetic-code translation (133:341).

• Research on Soviet-flown rats indicated that muscles in space not only atrophy but also lose cells, blood vessels and nerve connections (134:277).

• Entomologists demonstrated for the first time a genetic component to occupational differences among honeybee castes (133:342), while West German researchers provided the first conclusive evidence that a chemical "morphogen" regulates cell differentiation in fruit fly embryos (134:70).

• Scientists appeared to settle a century-old debate about evolutionary theory by documenting sympatric speciation in fruit flies (134:293).

• On the endangered species front: Birthday greetings were in order with the arrival of the first California condor chick conceived and hatched in captivity. The bird was the long-awaited offspring of a controversial captive breeding program (133:295). Blue poison arrow frogs, whose natural rain-forest habitat is being destroyed, successfully mated and produced young in captivity for the first time in the United States after scientists spent five years learning to create the proper breeding environment (133:247). In danger of extinction in their Madagascar home, the first two aye-ayes reached the United States, where the cat-sized primates will become part of a captive breeding program (133:183). Botanists predicted a catastrophic loss of U.S. plant species by the year 2000 (134:372).

George Grall

• Red deer provided the first mammalian evidence that male vocalizations can affect the timing of ovulation in females (133:24).

1988

Biomedicine

• With many AIDS-related discoveries already behind them, researchers concentrated on creating the first animal models of AIDS (134:198), managing for the first time to induce AIDS-like symptoms in laboratory animals (134:404); vaccine development (133:292); treatment with the only U.S.-approved AIDS drug, zidovudine (AZT) (134:231); and cell-killing toxins tied to an HIV-binding molecule (134:198, 358). Studies showed research could be complicated by the virus' rapid mutation rate (133:232; 134:38, 106), as well as by the observation that some HIV-induced antibodies may actually *enhance* infection (133:268). While some scientists tried to determine the age of HIV (133:373), others created statistical models for the spread of AIDS (133:182). Several studies found ways the virus may hide in the body (133:292, 341, 357), and a new HIV protein joined those already described (134:150). Officials reported the first case of laboratory-acquired HIV infection unrelated to needle punctures (133:22). Although the U.S. government approved major AIDS funding (133:134), critics attacked overall research efforts as inadequate both domestically (133:372) and internationally (133:405).

• Preliminary results of an ongoing U.S. study showed that an aspirin every other day dramatically cuts the risk of a first heart attack (133:68). But a British study suggested the aspirin-related decrease in risk actually is much lower (133:84), and the U.S. government warned aspirin makers not to make misleading claims based on early data (133:165). Aspirin combined with the clot-dissolving agent

streptokinase appeared to reduce mortality from heart attacks, as researchers used this and other approaches to diminish the risk of reformation of blood clots after initial clot-dissolving therapy (133:230).

• Genetics made more inroads into cancer research with two reports that scientists had found the first cancer-gene product known to bind human DNA and control other genes (133:391) and that the absence of tumor suppressor genes may lead to lung cancer (133:358). Addition of a contact-inhibitory factor changed cancer cells into apparently normal cells, and research on other cellular factors involved in the spread of cancer suggested new ways to stop metastases (133:37,343). Those in search of anticancer drugs took a new look at toxins attached to monoclonal antibodies against cancer cells (133:212).

• Researchers identified a new virus responsible for many cases of non-A, non-B hepatitis (133:308) and discovered a protein whose absence triggers the onset of Duchenne muscular dystrophy (133:4).

• Despite ongoing controversy over the ethics and medical value of fetal-cell transplants (134:296,324) and the initiation of a U.S. moratorium on federal funding for such experiments (133:260), researchers performed the first U.S. transplant of fetal cells into a human (134:324). A National Institutes of Health (NIH) advisory panel recommended resuming federal funding for fetal-cell transplant studies (134:197).

• An NIH panel gave its approval (though NIH Director James Wyngaarden withheld his) for the first experimental injection of genetically engineered cells into human patients (133:404; 134:228, 389).

• A newly described antibody found in people who later develop Type I diabetes appeared to be the best early marker of the disease in humans (133:389).

• An experimental birth-control vaccine did not cause side effects in early clinical trials in Australian women (133:407).

• A vitamin A relative called tretinoin (Retin-A) looked promising as a treatment for sun-induced skin aging, but scientists warned the public not to expect too much from the acne drug (133:71; 134:200, 375).

• Researchers elucidated the links between bone loss in osteoporosis, decreasing estrogen levels (134:5) and increased cadmium levels (134:356). Others reported that daily doses of fluoride added to calcium treatment can strengthen bone in some osteoporosis patients (134:134).

• As researchers published new circumcision studies, the medical community began reevaluating its policies on the common surgical procedure (133:182, 279).

• A medical committee released a working definition of the mysterious illness previously called Epstein-Barr virus syndrome, renaming the condition chronic fatigue syndrome (133:167).

• The American Academy of Pediatrics recommended cholesterol tests for all children over age 2 with a family history of heart disease (134:260).

• Due in part to the AIDS epidemic, the U.S. incidence of tuberculosis increased for the first time in 35 years (133:92), while new research pointed to the importance of vitamin D in boosting tuberculosis resistance (133:60).

• Scientists uncovered a hormonal imbalance that may account for bulimia (134:182).

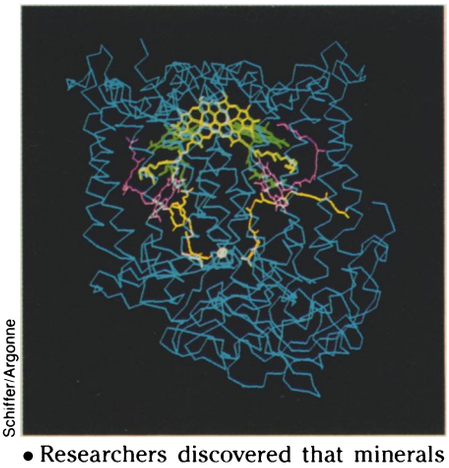
• Estrogen levels in women were directly correlated with individuals' abilities to perform specific tasks (134:341).

1988

Chemistry

• The fastest X-ray flash ever produced in a particle accelerator allowed scientists to photograph chemical reactions between biological molecules (134:20).

• The Nobel Prize for chemistry was awarded to three German scientists for their studies of the structure of the photosynthetic reaction center (134:282). U.S. scientists used gene recombination to study the structure of the photosynthetic reaction center (134:292).



Schiffer/Argonne

• Researchers discovered that minerals can help protein molecules to form crystals (133:154).

• A safer, alternative chemical reaction for producing the important semiconductor material gallium arsenide was developed (134:38).

• A chemist presented a theory of how chemical reactions can be manipulated by laser light (134:6).

• Two research teams constructed the first quantum mechanical model of a biomolecule and found important differences between it and the classical model (134:203).

• Scientists discovered an unusual organometallic compound that catalyzes reactions in water (134:380).

1988

Earth Sciences

• While scientists have been talking for more than a century about greenhouse warming of the climate, the issue hit the streets this year after a NASA scientist told Congress he was 99 percent certain that the Earth's climate had already started warming in response to "greenhouse" gases accumulating in the atmosphere (134:4). Earlier, climatologists had announced that 1987 was the warmest year on record for global average temperatures and that five of the warmest years had occurred in the 1980s (133:282). Scientists examining sea ice near the poles said the extent of the ice pack has shrunk in the last decade, possibly reflecting a warming in the ocean (134:230).

• After examining all the available data, an international panel of atmospheric scientists settled some of the debate over suspect satellite measurements (133:20), concluding that global ozone levels have indeed dropped during the last decade and that human pollutants, most notably chlorofluorocarbons (CFCs), are at least partly to blame for the loss (133:183).

• In the Antarctic, the ozone hole reappeared again this year but was smaller and more irregular than scientists had expected (134:260). Atmospheric chemists began to focus on a newly recognized phenomenon, known as polar stratospheric clouds, that help CFCs and halons "eat" Antarctic ozone (134:249). Meanwhile, researchers in Greenland found signs that chlorine chemicals may also be destroying ozone in winter over the Arctic (133:383), and laboratory researchers reported that CFCs may jeopardize the global ozone layer more than scientists had thought (134:148).

• Oceanographers discovered an extensive lava field that may have erupted during recent decades in the East Pacific

(133:342), and unexpected underwater volcanoes several hundred kilometers off Hawaii (134:309).

• Regulatory problems and concern over water leaks delayed the opening of an underground storage facility for radioactive waste in New Mexico (133:54, 188;134:199). Meanwhile, geoscientists were attempting to determine whether Nevada's Yucca Mountain is a suitable site for the nation's first repository for high-level nuclear waste (133:139). Some studies suggested work by federal scientists may lead to underestimates of the geologic hazards near Yucca Mountain (134:294).

• Climate researchers proposed that an out-of-place warm region in the Pacific last spring caused the severe Midwest drought during summer (134:247).

• Drilling into sediment and rock at the bottom of the Indian Ocean and Antarctic Sea, the Ocean Drilling Program pulled up pieces from the deepest layer of the ocean's crust (133:41), recovered the oldest sedimentary rock ever drilled from the ocean (134:166) and resolved debates about the origin of a large plateau off Antarctica (133:410; 134:73).

• In an effort to remove longstanding impediments to the ratification of two treaties concerning nuclear testing limitations, U.S. scientists and officials journeyed in September to the Soviet testing site in central Asia to monitor a nuclear explosion, following a reciprocal Soviet visit in August to the Nevada testing site (133:71; 134:172). In a separate, private agreement, a U.S. environmental group and the Soviet government staged mock-nuclear blasts in both the United States and the Soviet Union (133:245).

• Cores drilled from the ice caps of Antarctica and Greenland revealed clues about the complex workings of Earth's climate and about the ice ages in particular (133:295; 134:184). A study of mineral deposits in Nevada led scientists to question the popular view that changes in Earth's orbit cause the ice ages (134:356).

1988

Environment

• Researchers developed a timely new technology to remove nitrogen oxides (NO_x) from power plant flue gases (134:382). This year the pollutants were identified not only as a more serious acid-rain threat than previously suspected (133:276), but also as the combustion emissions whose removal could offer the biggest payoff in urban smog control (134:180). An international treaty drawn up this year would require that ratifying nations limit nitrogen oxide emissions to 1987 levels (134:333).

• EPA found that radon contaminated one in three homes surveyed (134:180), prompting a national radon health alert (134:206). Though the National Academy of Sciences confirmed that the natural pollutant causes cancer at levels found in the environment (133:39), several analyses seemed to suggest that exposure to a little radon may not be harmful (134:254).

• The Montreal Protocol — which will limit use of stratospheric-ozone-depleting chlorofluorocarbons (CFCs) — was ratified by enough nations to ensure that it would go into effect in January 1989, the earliest possible date (134:333). In preparation, companies scrambled to develop alternatives to these popular industrial chemicals (133:234). Makers of foam food-service products announced a phaseout by year's end of their CFC-made products (133:247).

• One study showed that low-lying clouds — such as those veiling mountain tops — can dramatically concentrate the toxic air pollutants to which forests are exposed. Another quantified the type of acute toxic effects these clouds appear to cause in high-altitude forests in the southeastern United States (134:180).

• Toxicologists found that dioxins, newly identified in consumer paper products (134:279), may represent a more serious environmental threat than previously thought (133:269). Found in the blood of Vietnam veterans decades after their exposure to Agent Orange (134:325), dioxins may be responsible for a range of adverse health effects identified among those soldiers (133:372).

• New rules aimed at limiting the amount of lead that gets into drinking water (134:118) were announced at about the time a host of studies were published identifying this contaminant as having the ability to increase blood pressure — and therefore the risk of early death — in adults exposed to levels formerly regarded safe (134:158).

• The first survey of worldwide metal pollution indicated its toxicity exceeds that of both radiation and organic chemicals (133:309).

• The newly reauthorized Federal Insecticide, Fungicide and Rodenticide Act called for testing of about 600 key ingredients used in existing pesticides, and prohibited future compensation of manufacturers for chemicals they are forced to remove from the market (134:270).

• One water-quality study identified 2,100 different compounds contaminating U.S. drinking water (133:39). Another showed that estuaries can accumulate toxic pollutants dumped into the ocean (133:363).

• An economic analysis showed that government policies throughout the world are inadvertently fostering serious levels of deforestation (133:366).

• Massive tree planting drew attention as an important first step in limiting the atmospheric buildup of carbon dioxide, the leading "greenhouse" gas (133:136, 285; 134:411).

• Sweeping through some 20 percent of Yellowstone National Park last summer, wildfires taught ecologists new lessons on how forests burn during exceptionally dry years (134:314). Looking to the future, researchers prepared to study how such extensive fires will affect Yellowstone's ecosystem (134:330).

• Research showed that even where wood smoke is more prevalent in the United States, vehicular pollution tends to be a more potent environmental hazard (134:102).

• Animal studies showed that common environmental pollutants — such as carbon monoxide from cigarette smoke — can induce permanent hearing loss when exposure occurs in the presence of loud noise (134:327).

1988

Food Science

• Agronomists developed a new form of maize — with twice the usable protein and the look and taste of ordinary corn — that might double the efficiency of subsistence farming and help stem the malnutrition endemic in many maize-dependent societies (134:104).

• Vitamin E was shown not only to boost immunity in humans and farm animals, but also to help some pigs survive life-threatening stress (134:351).

• A saturated fat was identified that does not raise serum cholesterol (133:332). Studies suggested that people who have high cholesterol levels may eventually benefit from diets high in rice bran (134:308) or an enzyme that converts dietary cholesterol into a harmless substance (134:63).

• Two studies linked the type and quantity of dietary fat with the incidence and severity of breast cancer (134:100, 302).

• Research suggested that high-fructose diets may increase the risk of heart disease, especially for persons who have higher-than-normal blood levels of insulin or triglycerides (133:196).

• Scientists identified a range of potential benefits in fish oils – from helping create low-cholesterol eggs (133:300) to prolonging the effectiveness of angioplasty (134:197, 343) and boosting protection from autoimmune disease (134:228). Cold-water lakes may provide a new source of fish high in the omega-3 fatty acids believed responsible for these effects (134:228).

• Certain fatty acids, as well as the ellagic acid found in some fruits and nuts, showed some evidence of being able to prevent cancer (133:332, 216). Fruits and vegetables – not grains – appeared to be the most beneficial sources of the dietary fiber that seems to help protect against colon cancer (134:359). A survey showed that most people in the United States do not eat diets plentiful in foods linked with potential anticancer properties (133:174).

• A method called supercritical extraction offered a quicker, safer and potentially less expensive way to search for low-level contamination of fat-soluble chemicals in foods (134:63).

• Even uncracked eggs were found to harbor disease-causing *Salmonella* bacteria (133:251).

• Nine more cheeses were shown to fight tooth decay, quadrupling the number of cheeses known to have this effect (134:218).

• Researchers discovered low levels of dietary iron can leave women chilly (133:300), while low levels of magnesium may contribute to high blood pressure, heart disease, miscarriage and a range of other problems (133:356). Zinc deficiencies, meanwhile, were associated with problems involving both learning and immune function (134:22).

1988

Math & Computers

• A computer virus brought a nationwide computer network to a standstill (134:310), adding to growing worries about computer security (134:199).

• Researchers achieved record computational speedups by carefully crafting computer algorithms to get the most out of a parallel processing machine (133:180).

• Mathematicians found a way to tell when chaotic "orbits" follow a true path (134:360).

• Using a network of computers scattered across three continents, a team of computer scientists and mathematicians managed to factor a 100-digit number (134:263). Another group showed that large-scale factoring could be done on large collections of small machines (133:62; 134:319).

• Excitement over a purported proof for Fermat's last theorem faded quickly when flaws turned up in the proof (133:180, 230).

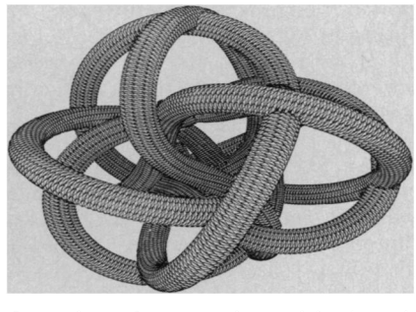
• Major reports cited the need for a stronger national effort in supercomputing (133:172) and for a nationwide computer network for research and education (133:394).

• Computers played a large role in the discovery of the 30th Mersenne prime (133:85) and in finding a counterexample to disprove the Euler conjecture, an extension of Fermat's last theorem (133:70).

• A Japanese computer scientist computed pi (π) to 201 million decimal places (133:215).

• The National Science Foundation initiated two innovative mathematics programs: the Geometry Supercomputer Project (133:12) and a center for mathematics and molecular biology (134:319).

• Mathematicians proved several important results in knot theory (133:328; 134:283).



Dobkin/Princeton Univ.

• In a referendum, members of the American Mathematical Society voted to keep the organization from participating in activities that could be interpreted as support for the Strategic Defense Initiative (133:213).

• A graduate student developed the world's first accurate, large-vocabulary, speaker-independent speech recognition system (133:356).

• The chess computer Deep Thought earned the highest chess rating yet achieved by a machine, putting it in the top ranks of all chess players (134:396).

• An extensive computer search solved a famous combinatorial problem (134:406).

1988

Paleobiology

• Researchers uncovered a 120-million-year-old bird fossil in Spain that they say is the second-oldest known bird (133:102). In Germany, scientists found a sixth specimen of the rare archeopteryx, which is the oldest known type of bird (134:28).

• Discoveries of nests containing dinosaur eggs revealed that some dinosaur parents fed and cared for their recently hatched young (133:217). Paleontologists also found fossils of embryonic and young dinosaurs that tell about the earliest development of these huge creatures (134:261).

• In Iowa, geologists discovered a cache of amphibian fossils that are the oldest well-preserved land vertebrates in North America (133:406).

• Finds near the North and South Poles led scientists to wonder how dinosaurs survived cold, possibly freezing, temperatures and long periods of dark (133:184).

• Australian fossils revealed a unique evolutionary tale about a continent full of animals cut off from other major land masses for the last 50 million years (133:248).

• Continuing to uncover new information concerning the causes of the mass extinctions at the Cretaceous-Tertiary boundary, geologists found evidence suggesting: a tsunami hit along the shores of the Gulf Coast (134:70); the planet's climate cooled right before the boundary; and at least two extraterrestrial bodies crashed into Earth (134:309). Some scientists proposed that the widespread death of ocean plankton after an impact could have caused a global heat wave that helped wipe out other animals (133:164).

• Vertebrate paleontologists charged that the federal government is fostering policies concerning the protection of fossils that will hurt their science (134:262).

1988

Physics

• The discovery of a thallium-based superconductor raised the superconducting transition temperature to a record 125 kelvins (133:148, 213). Researchers found several new high-temperature supercon-

ductors, improved techniques for fabricating these materials and argued about theories attempting to explain the phenomenon (133:116, 309, 406; 134:63, 86, 149, 212, 287, 348).

• The Department of Energy selected a patch of Texas farmland as its site for the Superconducting Super Collider (133:10, 68; 134:252, 325).

• Using a laser cooling process, researchers produced the coldest three-dimensional gas ever observed (134:52). Another group detected a transition from orderly to chaotic behavior in a sample of cooled ions (134:69).

• Different experiments gave conflicting evidence for the existence of a fifth force of nature (134:85, 214, 389).

• Physicists obtained experimental evidence for a quark-gluon plasma, a new state of matter created in the violent head-on collision between two atomic nuclei (134:229).

• Using a powerful laser, researchers at the University of Rochester managed to compress deuterium-tritium fuel capsules to 100 times the fuel's liquid density, an important milestone on the road to harnessing fusion energy (134:214).

• Technical difficulties at the recently completed Stanford Linear Collider delayed the search for Z° particles (134:167).

• Particle physicists Leon Lederman, Melvin Schwartz and Jack Steinberger won the physics Nobel Prize (134:282).

• In probing the subtleties hidden within physical laws, a group of physicists speculated about the possibility of time travel by way of wormholes (134:302).

• Astronomical neutrinos remained as elusive as ever, prompting investments in new theories and experiments (133:246, 277, 359).

• The photorefractive effect was applied in a motion-sensing microscope and for tracking and reproducing robot arm motions (133:254; 134:294).

• An innovative apparatus for measuring surface forces provided insights into the nature of thin lubricating films (133:283).

• A novel X-ray technique gave researchers the most detailed look yet at the positions of atoms along a boundary between two crystals (134:348).

• A theorist showed that holographic patterns created by photoelectrons can be used for determining the atomic structure of surfaces (134:252).

1988

Science & Society

• Preliminary results of controversial experiments involving the first environmental releases of genetically engineered microbes indicated the microbes don't go far and don't readily exchange DNA with native bacteria (133:117). Researchers also field-tested the first genetically engineered pesticide (134:27).

• While Congress debated the economic and ethical implications of a U.S. Patent and Trademark Office decision to allow patents on higher animals (133:231), the first such patent was issued on a gene-altered mouse (133:244).

• The new omnibus trade bill brought a wide range of changes – in patent law, in oversight of international scientific exchanges and even in the name of the National Bureau of Standards, which became the National Institute of Standards and Technology (134:101).

• In a decision with great potential impact on current research practices, a California state Court of Appeal ruled that individuals may retain rights to tissues or cells removed from their bodies during surgery and subsequently used in scientific research (134:68).

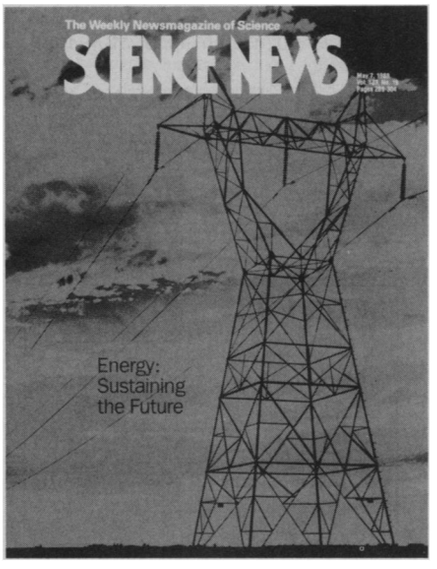
• Two new surveys – one of students' achievements, the other of teaching and teacher training – found that U.S. primary and secondary education in science and math is foundering (133:165).

• The U.S. and Soviet academies of science signed a five-year cooperative agreement to broaden their scientific relations (133:55). Later, Reagan and Gorbachev agreed to expand the scope of a cooperative space pact (133:374). High-ranking officials in each country issued unofficial criticism of scientific priorities in both the United States and Soviet Union (133:313; 134:53, 407).

• The National Institutes of Health and the Department of Energy geared up for a multibillion-dollar effort to map the human genome (133:117).

• The U.S. Army proposed expanding its biological warfare research facility in Dugway, Utah, stirring the ire of local residents and others (133:100, 229) before backing down to a more conservative plan (134:392). Defense Department researchers encountered similar community opposition to electromagnetic-pulse simulators, and ultimately was forced to shut down most such facilities until it established they would not harm the environment (133:293).

• From tree planting and efficiency standards to innovative power electronics, researchers explored novel ways to save energy and reduce pollution (133:296; 134:30).



• While the President's science adviser called for more restrictions on what government data can be released under the Freedom of Information Act (133:382), a number of private organizations fought to broaden the data open to public scrutiny (133:181, 382; 134:30).

• U.S. researchers publicly acknowledged that radiation from Soviet nuclear-powered satellites routinely disrupt the operation of their air- and space-borne scientific instruments (134:340).

• An Institute of Medicine report recommended no change in U.S. polio vaccine policy despite a persistent but low incidence of vaccine-induced paralysis (134:43).

1988

Space Sciences

• The successful flight of Discovery marked the shuttle's return to life, more than 2½ years after the Challenger explosion killed the crew of seven and paralyzed nearly the whole U.S. space program (134:231).

• Pluto yielded evidence of an atmosphere (133:391, 134:319) and polar caps (134:156) to astronomers taking advantage of a rare alignment between the planet and its moon Charon.

• In photos taken by the U.S. Solar Maximum Mission satellite, observers found at least seven sun-grazing comets, whose orbits carry them so close to the sun that they are apparently destroyed on the way past (134:39, 375,407).

• A project called International Solar Month combined the labors of researchers from more than a dozen countries to study the sun from spacecraft and the ground (134:134). A malfunction prevented the participation of the Soviet Phobos 1 craft (134:183), one of a pair that were the first vehicles sent toward Mars since the launching of the U.S. Viking project in 1975 (133:392).

• Researchers cited Earth-based observations of Neptune as evidence of detailed structure in its clouds and of the possibility that it has a magnetic field (134:310).

• Some scientists cited evidence of possible spreading rift zones on Venus as an indication the planet may have undergone a form of plate tectonics (133:199).

• An electrical fire at Cape Canaveral caused minor damage to the Magellan spacecraft, whose scheduled 1989 launching to Venus would make it the first U.S. mission sent to another planet since Pioneer Venus in 1978 (134:277).

• Instruments launched from a sounding rocket as part of a project called Echo 7 provided the first look at electrons spiraling around one of the lines of Earth's magnetic field (134:219).

1988

Technology

• For the first time, researchers made a microscopic image using a positron microscope (133:124). Later, two research teams unveiled the more advanced positron reemission microscope (134:84).

• The National Academy of Engineering established the $350,000 Charles Stark Draper Prize, intended as a kind of Nobel Prize for engineering (134:212).

• Scientists got a record 27.2 percent efficiency from a solar cell (134:123). A device concentrated sunlight 60,000 times using nonimaging optics (133:203).

• General Motor's solar-powered car Sunraycer set a new speed record — 48.712 mph — for a land vehicle powered solely by the sun (134:30). The first U.S. solar-car race was held in California (134:271).

• The human-powered aircraft Daedalus set three records while attempting to fly from Crete to mainland Greece, but broke and splashed down a few feet before reaching shore (133:277).

• Researchers unveiled a powerful, surface-emitting semiconductor laser that generates a tight, focused beam (134:390).

• Scientists developed the world's fastest optical switch, made entirely of quartz (133:86).

• The first "high-temperature" superconducting motors were developed (133:136).

• The National Bureau of Standards found that a proposed digital tape encoding system degrades sound and does not achieve its stated purpose (133:165).

• Transistors sensitive to a voltage change equivalent to one electron were created (133:166).

• Scientists showed how unrelieved stresses created during manufacturing cause computer chips to fail (134:36).

• British scientists manufactured organic polymer transistors that they say are 1,000 times better at directing electrons than any before built (134:166).

• An optical-delay camera was built to take pictures of events that have already occurred a split-second before the shutter clicks (134:223).