SCIENCE NEWS of the Year

This is a review of important science news stories of 1991 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. 139 is Jan.-June; Vol. 140 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 $1 each (prepaid); write to* SCIENCE NEWS, *1719 N Street, N.W., Washington, D.C. 20036.*

1991

Anthropology

• The discovery of four skulls belonging to 50-million-year-old primates dramatically pushed back estimates of when early primate groups first evolved (139: 20).

Denver Museum of Natural History

• An Ethiopian site yielded 3-million-year-old fossils that expanded the anatomical diversity of the earliest known hominid species (139: 182).

• Archaeologists found a flint hand-ax in Greece, confirming the presence of human ancestors in the area between 200,000 and 400,000 years ago (140: 68).

• A primate jaw found in Namibia and dated at about 10 million years old significantly expanded the known range and distribution of ancient higher primates in Africa (139: 405).

• Upon reexamining maps of an ancient Maya city sited in arid lowlands, researchers argued that the growth of such urban centers relied on the construction of huge reservoir systems (139: 85).

• Anthropologists challenged the long-standing claim that Neandertals practiced cannibalism at an Italian cave more than 50,000 years ago (139: 341). Others reexamined fossil evidence and presented the controversial view that Neandertals did not coexist in the Middle East with anatomically modern humans from around 100,000 to 40,000 years ago (139: 360).

• A comparative analysis of skulls indicated that the anatomy of Australian aborigines greatly resembles that of long-isolated Tasmanian aborigines, challenging the assumption that anatomical differences inevitably arise in separated human populations (139: 111).

• Excavations at a 3,500-year-old Peruvian site, considered one of the earliest major settlements in the New World, suggested that residents rejected grain cultivation in favor of growing cotton (139: 38).

• An anatomist developed the first method for directly measuring daily or weekly tooth-wear rates, a technique likely to provide better comparative data to evaluate the teeth of human ancestors (139: 102).

• A hilltop in Greece unexpectedly yielded an inscribed monument, described in historical accounts, commemorating a Roman military victory in 86 B.C. (139: 7).

1991

Astronomy

• British astronomers found tantalizing evidence that an unseen planet, with about 10 to 15 times the mass of Earth, may orbit a pulsar some 33,000 light-years from Earth (140: 53).

• A new map showing the distribution of galaxies across the sky deepened the mystery of how galaxies formed (139: 22).

• The research satellite ROSAT used its X-ray eyes to map what appear to be giant clusters of quasars 8 to 12 billion light-years from Earth – more than halfway to the edge of the observable universe. These clusters suggest the universe began getting lumpy earlier, and on a larger scale, than previous sky maps suggested (139: 52).

• Examining faint starlight from several ancient Milky Way stars, astronomers detected a far greater abundance of beryllium than predicted by the standard Big Bang model. While these findings don't contradict the premise that the expansion of the universe began with a giant explosion, they do raise questions about key assumptions of the model, such as the notion that the cosmos began as a perfectly smooth mixture (140: 151).

• A new spacecraft survey of gamma-ray bursters indicated that they occur uniformly throughout the sky rather than clustering in or near the Milky Way. The finding appears to dash the prevailing theory about the type of cosmic powerhouse that might briefly spew such energetic emissions (140: 196).

• Astronomers found the most distant quasar yet observed (139: 276).

• A U.S.-British research team detected the most luminous astronomical object ever observed – possibly a quasar buried at the core of a hot, massive dust cloud (139: 406).

• Researchers found evidence for the most massive black hole ever postulated to reside in a galaxy (139: 247).

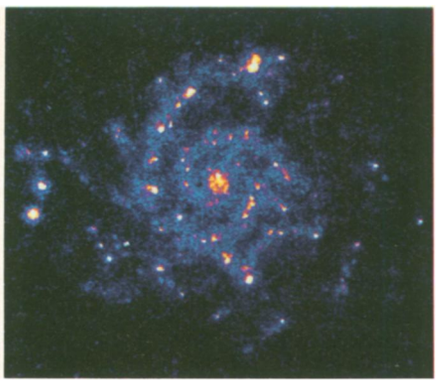
• In a study of starlight from two globular clusters that rank among the Milky Way's oldest structures, scientists found strong evidence that our galaxy took three times longer to form than suggested by a widely accepted model (139: 310).

• Changes in light spectra emitted by supernova 1987A hinted at two dramatic possibilities: The abundances of various elements in the supernova may differ widely from those in our solar system, or a new energy source, possibly a pulsar, lies hidden at the supernova's core (140: 246).

• An image taken by the Hubble Space Telescope revealed a gas ring around supernova 1987A. Astronomers used the ring to obtain a highly accurate measurement for the distance between Earth and the Large Magellanic Cloud, the galaxy in which 1987A resides. The measurement may help scientists recalibrate the Hubble constant, used to determine how the expansion velocity of the universe changes with distance (139: 59).

• Using a new, high-resolution infrared detector that homes in on galactic hot spots, researchers developed an alternative technique for tracking supernova remnants (140: 260).

• Astronomers unveiled the first ultraviolet images of several heavenly objects, including two spiral galaxies as well as the Crab nebula and the globular cluster Omega Centauri (139: 52, 356).



NASA

• After considering hundreds of projects and consulting with nearly 1,000 of their colleagues over the past two years, a panel of astronomers presented a list of priorities for ground-based and space-based research through the year 2000. The panel gave highest priority to refurbishing and maintaining existing national observatories (139: 183).

• Scientists discovered 10 more millisecond pulsars, nearly doubling the known number of these rapidly rotating, compact stars (140: 39).

1991

Behavior

• Studies indicated that a gene initially alleged to create a susceptibility to severe alcoholism may actually intensify the severity and medical consequences of alcoholism and several other psychiatric and neurological conditions (140: 190, 213).

• A survey of young adults in the Detroit area found that almost one in 10 had developed post-traumatic stress disorder at some time in their lives (139: 198). Another study showed that nearly nine out of 10 surviving Korean War POWs still suffered from post-traumatic stress disorder more than 35 years after release from captivity (139: 68).

• Long-term studies in England and the United States indicated that family conflict preceding a divorce contributes as much as the divorce itself to children's later school and behavioral problems (139: 357).

• People reporting high levels of mental stress displayed an increased risk of cold-virus infection and the development of cold symptoms (140: 132). In a related study, immune function deteriorated among people caring for spouses with Alzheimer's disease while receiving little emotional support from relatives and friends (139: 216).

• Investigators warned mental health workers that a substantial number of children and adolescents treated with antipsychotic drugs at a state hospital developed muscular rigidity, slowed movements and other signs of parkinsonism (140: 276).

• A national survey suggested that self-esteem plummets among teenage girls, largely because schools gear instructional methods to boys' learning styles; yet long-term studies yielded no evidence of a teenage gender gap in self-esteem (139: 184).

• Research inspired by Charles Darwin's theory of natural selection yielded controversial insights into evolved mental rules of thumb shared by all humans (140: 232).

• Evolutionary research contributed to growing skepticism about Sigmund Freud's theory of the Oedipus complex (140: 248).

• A study of people with severe depression indicated that those who respond to antidepressant medication should be kept on high doses of the drugs for at least three years (139: 56).

• Scientists probed a deeply held, cross-cultural belief that people, food and other items transfer contagious physical or psychological properties – an investigation with important implications for understanding public attitudes about AIDS victims (140: 138).

• Citing recent laboratory research, a psychologist argued that people tend to believe what they read and hear before critically evaluating the information (139: 14).

• In a preliminary report, researchers proposed that a gene with unknown functions may act as a predisposing influence on nearly 8 percent of all suicides and psychiatric hospitalizations in the United States (139: 373).

• High-quality daycare programs for infants fostered improved social skills and academic achievement in elementary school (140: 118).

• Brain-damaged patients provided evidence that different brain systems, devoted to either speaking or writing words, distinguish nouns and verbs separately (139: 134). Other work with the brain-damaged suggested that the brain uses separate mechanisms to identify vowels and consonants (140: 180).

• Adults and teenagers who had suffered from fetal alcohol syndrome displayed numerous disabling mental and behavioral problems (139: 244).

1991

Biology

• Geneticists identified a bumper crop of new human genes, including those responsible for precancerous colorectal polyps (139: 103), colon cancer (140: 86), early-onset Alzheimer's disease (139: 117), fragile X syndrome (139: 359), Marfan's syndrome (140: 55) and the rare skin-blistering disorder epidermolysis bullosa (140: 197).

• Molecular biologists discovered how to genetically engineer reoviruses, taking a first step toward developing vaccines against diarrheal diseases that kill millions of children in the Third World each year (139: 4).

• Primitive microbes called mycoplasmas helped kill AIDS-infected cells cultured in the laboratory, lending credence to a theory that mycoplasmas play a role in AIDS (139: 133).

• Cancer researchers uncovered a protein present on melanoma tumor cells that may prove useful as part of a "vaccine" to boost the immune systems of melanoma patients (140: 388).

• Molecular biologists developed a quick way to identify pieces of human genes that code for proteins, an advance that could speed up the Human Genome Project (139: 389).

• Scientists used genetically engineered cold viruses to carry healthy genes into the lung cells of rats – a procedure they may one day test in humans with genetic diseases (139: 246). Other researchers demonstrated a strategy for treating coronary artery disease by splicing a foreign gene into the arteries of dogs (139: 391).

• Vision researchers reported the first behavioral evidence that retinal cells transplanted into blinded animals can restore the ability to sense and respond to light (140: 325).

• Ecologists found that plant hybrids harbor a greater diversity of insect species than their parents, fueling a debate over whether Congress should extend the Endangered Species Act to protect threatened plant hybrids (140: 102).

• In sheep studies, researchers found that a specific region in the fetal brain may trigger the events leading to birth (140: 182).

• Biotechnologists genetically engineered goats, pigs and other animals to produce pharmaceuticals such as human hemoglobin (139: 391), the blood-clot dissolver TPA and the emphysema drug alpha-1 antitrypsin (140: 148).

• A neurobiologist discovered a distinct difference between homosexual and heterosexual men in the brain region that controls sexual behavior (140: 134). Two independent groups reported isolating a specific nerve-cell molecule, called the NMDA receptor, that may play a role in brain damage (140: 333). Another group found preliminary evidence that nerve cells in the brains of mice mix and match their genes during early development (140: 212).

• A surgeon and a cell biologist turned rat muscle to bone in an experiment that may pave the way for the production of spare body parts (140: 244).

• Developmental biologists performed experiments that challenged a widely held theory that retinoic acid helps direct body-pattern development in embryos (139: 149). Another group found that creatures as diverse as fruit flies and mice share a common set of genes for organizing the body's architecture (139: 255).

• Plant physiologists found evidence that plants acquired cellular organelles, such as chloroplasts, by gobbling smaller cells many times during evolutionary history (139: 164).

• Immunologists discovered a candidate "pluripotent stem cell," thought to give rise to all human blood cell types (140: 292).

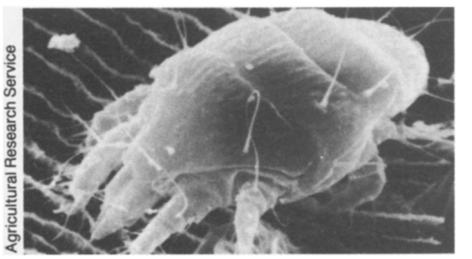
• Researchers lowered high blood cholesterol levels in mice by injecting them with genes for high-density lipoprotein, part of the "good" cholesterol (140: 181).

• A malaria vaccine composed of two proteins taken from the malarial parasite completely protected mice from the disease (139: 276).

• Molecular toxicologists identified a protein that binds to complexes of dioxin and its cellular receptor, allowing the complexes to invade the nuclei of cells and wreak their toxic effects. The finding suggests that receptor-bound dioxin levels too low to bind to this protein might be safe (139: 308).

• Computer modelers showed how steroid receptors bind to the genes they regulate (140: 85).

• In Louisiana, entomologists released English honeybees resistant to bee-killing tracheal mites in an attempt to breed mite resistance into American honeybees (139: 5).



Agricultural Research Service

• Biologists launched the first reintroduction of endangered black-footed ferrets into the wild and prepared to do the same for endangered Puerto Rican toads (140: 279, 316).

• Reproductive biologists learned some curious facts about the internal cues that trigger mating in the red-sided garter snake (139: 300).

• German cell physiologists Erwin Neher and Bert Sakmann shared the Nobel Prize in Physiology or Medicine for proving that tiny pores dot the outer membranes of cells and allow the cells to take up and excrete charged atoms (140: 231).

1991

Biomedicine

• The National Cancer Institute launched more than 50 clinical trials of retinoic acid (a chemical cousin of vitamin A) against several types of cancer, following preliminary results indicating that the chemical helped cancer cells mature so that they might die (139: 341). Tamoxifen, a hormone-like drug, appeared safe in trials designed to help prevent breast cancer in healthy, at-risk women (139: 222). Women with breast cancer who timed their breast surgery to coincide with certain days of the menstrual cycle improved their chances of long-term survival (139: 365). Two separate studies suggested that regular aspirin doses decrease the risk of colon cancer (139: 166; 140: 324). And cancer researchers reported that a combination of radiation and chemotherapy worked best in preventing the recurrence of rectal cancer (139: 190).

• A federal panel urged parents to feed their kids a low-fat diet designed to prevent the development of coronary artery disease (139: 229). Cardiologists confirmed that estrogen supplements help protect postmenopausal women against coronary artery disease (140: 165). A study confirmed aspirin's benefit in reducing the risk of a first heart attack in women (140: 55).

• The first experimental AIDS vaccine to enter human testing caused no ill effects and triggered potentially protective responses among healthy volunteers (139: 38). Preliminary results also suggested the vaccine boosted the immunity of people already infected by the AIDS virus (139: 374). A new drug treatment for an eye infection that blinds many AIDS patients provided an unexpected survival bonus (140: 260). Epidemiologists reported that it's much easier for an infected man to spread the AIDS virus to a female sexual partner than vice versa (140: 219). Scientists added to evidence that the AIDS virus can spread through breast milk (140: 135). Antibody injections helped children infected with the AIDS virus stave off potentially fatal bacterial infections (139: 55). And the Food and Drug Administration approved the anti-AIDS drug DDI for use in adults and children who cannot tolerate zidovudine (AZT), the only other AIDS drug approved in the United States (140: 77).

• Researchers treated two groups of melanoma patients with genetically engineered white blood cells or cancer cells designed to secrete tumor-killing chemicals (139: 69, 326). They also won regulatory approval to seed the failing livers of desperately ill children with genetically marked liver cells (139: 228) and to insert corrected copies of the low-density lipoprotein receptor into children and young adults with familial hypercholesterolemia (140: 230).

• Cystic fibrosis researchers discovered that a faulty gene for a cellular chloride channel leads to the mucus-clogged organs characteristic of the disease. They also successfully inserted corrected copies of this gene into the lungs of animals and used two experimental enzyme treatments to alleviate patients' symptoms (139: 132).

• Drugs that fight hypertension in the elderly dramatically slashed the risk of life-threatening strokes (139: 404). New evidence strengthened the theory that a kidney-secreted enzyme helps predict heart attack risk (139: 245). Two separate explanations for the high rate of hypertension among U.S. blacks – one environmental, the other genetic – gained ground (139: 111; 140: 254).

• A blood test offered hope for early diagnosis of prostate cancer (139: 261), while a new drug promised relief for men afflicted with a swollen prostrate (139: 357).

• For cigarette smokers considering a New Year's resolution: Studies showed that smoking raises blood pressure (139: 279), increases the risk of urinary incontinence and leads to premature wrinkling of the skin (139: 309).

• A federal panel advised people with asthma against reliance on bronchodilator drugs (139: 86). An entirely new class of experimental anti-inflammatory drugs provided sneeze-and-wheeze relief for asthma and allergy sufferers (139: 138).

• Researchers reported that couch potatoes face a higher risk of developing Type II diabetes than their active peers (140: 36).

• An antibody that sops up bacterial toxins saved the lives of patients with so-called gram-negative bacterial infections (139: 100) and won approval from the Food and Drug Administration (140: 187).

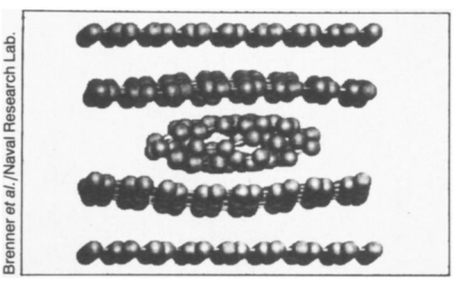
• Fertility researchers found that older mothers do not have a higher chance of having a baby with nonchromosomal birth defects than younger moms, although they are still more likely to bear a child with the wrong number of chromosomes (139: 151). Older mothers actually run a lower risk of endometrial cancer (139: 231). Scientists discovered that human egg cells secrete a chemical beacon that summons sperm (139: 214). A separate team developed a male contraceptive drug with few ardor-dousing side effects (139: 407).

• A powerful steroid drug proved itself by slowing progressive muscle weakness in boys with muscular dystrophy (139: 262).

1991

Chemistry

• The 60-carbon spherical molecule called the buckyball and its all-carbon cousins, the fullerenes, took center stage throughout the year. Scientists continued to raise the temperatures at which fullerene-based superconductors work, reaching a high of at least 42 kelvins (139: 244; 140: 84). Other investigators discovered how fullerene molecules move, arrange themselves into films, bounce off other surfaces, link up with other molecules or atoms, and capture atoms (140: 120, 391). Fullerenes displayed nonlinear optical properties (140: 127), formed tubes and enhanced the formation of diamond film (140: 310). Some researchers expressed concerns about the potential health hazards of these all-carbon molecules (139: 54).



Brenner *et al.*/Naval Research Lab.

• A team of chemists used femtosecond pulses of light to control molecular dynamics in making iodine gas fluoresce (139: 142). Other groups used lasers to control hydrogen chloride's ionization rate (139: 245), to pinpoint atoms in a moving beam (140: 247), to get electrons and protons to join and form hydrogen (140: 23) and to break specific chemical bonds (140: 375). Researchers discovered that they could orient chilled molecules in an electric field (140: 231).

• Cystallographers determined the structure of a "coiled coil" protein (140: 279) and of a monkey virus related to the papillomavirus (140: 372). Others used X-ray diffraction to study tiny bismuth crystals (140: 164) and a dehydrogenase (140: 52). Physicists used electron holography to image the three-dimensional atomic structures of several types of materials (140: 199).

• A team of chemists detected helium in gases released during cold-fusion experiments (139: 180). But most cold-fusion investigators found themselves frustrated by inconsistent results in their studies, and the National Cold Fusion Institute in Salt Lake City shut down for lack of money (139: 392).

• Biochemists discovered a new way to block the activity of a viral enzyme called reverse transcriptase, which plays an important role in promoting HIV infection (140: 326).

• Scientists learned that diffusing atoms can displace surface-bound ones (140: 116).

• Computer modelers demonstrated that even water droplets containing fewer than 100 molecules tend to behave in much the same way as their larger counterparts (140: 213). Other modelers showed how defective hydrogen bonds help make water flow (140: 359).

• Theorists came up with a new way to explain how atoms in sulfur trioxide and those in similar molecules connect and distribute their electrons (139: 69).

1991

Computers & Math

• Two computer scientists discovered a method that could speed the sorting of data (139: 406).

• A number of incidents demonstrated how a seemingly minor, isolated fault can trigger the failure of a computer-controlled system (139: 104; 140: 7, 127, 388).

• The rapid growth of interest in visualization and the creation of virtual environments produced such systems as the virtual windtunnel, which was designed for interactively exploring aerodynamic flow patterns (139: 398).

• The National Institute of Standards and Technology issued a proposal for a digital signature standard (140: 148).

• A Japanese mathematician proved that the Mandelbrot set's boundary has a fractal dimension of 2 (140: 331).

• A mathematician uncovered an unexpected gravitational-wave effect in the solutions to Einstein's equations for general relativity (140: 198).

• A checker-playing computer program earned the right to challenge for the world title (140: 40).

• The computation of pi reached 2.2 billion decimal digits (140: 127).

• Researchers developed a new class of random-number generators (140: 300).

• Mathematical models of synchronized oscillators provided insights into biological phenomena (140: 136).

• A computer programmer developed an efficient method for analyzing the outcome of chess games and found for one particular combination of six pieces a winning strategy 223 moves long (140: 365).

1991

Earth Science

• The year brought more bad news about stratospheric ozone. A United Nations panel announced that over the last two decades, the global ozone layer has thinned significantly during spring and summer months, when people and plants face the most danger from ultraviolet radiation (140: 278). Scientists reported that ozone concentrations over the mid-latitudes are dropping faster than previously thought (139: 231), and they found elevated levels of ozone-destroying chemicals over the United States (139: 84). This year's Antarctic ozone hole was the most severe on record (140: 199, 244).

• Measurements of global temperatures revealed 1990 as the warmest year on record (139: 36). An El Niño warming developed in the Pacific (140: 87, 389).

• Nations began negotiating a climate treaty with hopes of signing it next year (139: 200), but the talks proceeded very

slowly (140: 215). Scientists debated whether adding iron to the ocean around Antarctica might slow global warming (139: 63, 327). Some experts predicted that efforts to cut back on carbon dioxide emissions could temporarily hasten the warming (139: 103).

• Researchers sent a sound signal through the world's oceans as part of an experiment to monitor global warming (139: 53, 222). In Greenland, investigators made progress in an attempt to drill through 3,000 meters of ice to study climate changes of the past (140: 168).

• Mt. Pinatubo erupted in the Philippines, killing several hundred people (140: 7). Scientists predicted that the volcanic cloud will temporarily cool the Earth and hasten ozone destruction (140: 132).

• Geologists studying one of the world's largest volcanic eruptions, which occurred about 250 million years ago, suggested that it may have caused the greatest mass extinction in Earth's history (140: 20).

• The Energy Department declared itself ready to open the nation's first permanent repository for nuclear waste (140: 228), but legal questions delayed the first waste shipments to the New Mexico site (140: 245). Geologists debated whether a site in Nevada will make a safe location for another nuclear waste repository (140: 262).

• Two researchers rewrote plate tectonic history by proposing that Antarctica was once connected to North America (139: 266). In the Pacific, oceanographers discovered sites of recent seafloor spreading (139: 164) and volcanic eruptions (140: 372), and drilled deep beneath the seafloor to study its formation (140: 324).

• Researchers located the first known example of a quake fault rupturing the surface in eastern North America (139: 164). Scientists in California are attempting to predict the timing of an expected earthquake, in hopes of alerting the local population (139: 376).

• NASA launched its "Mission to Planet Earth" by sending up a satellite to study the ozone layer (140: 181). The space agency backed away from plans to launch a series of large, expensive satellites to monitor global change and instead will favor smaller satellites (140: 198).

• Scientists used sophisticated computer simulations to study whether a new breed of supersonic planes will damage the ozone layer (140: 270). Experts announced that the space shuttle and other rockets do not cause significant harm to the ozone layer (140: 237).

1991

Environment

• In the closing days of the Persian Gulf war, Iraqi troops unleashed the largest oil spill in history and ignited oil-well fires whose sooty plumes altered weather in the area for months (139: 71, 197). Although studies suggested the soot wouldn't cause worldwide climate changes, an inability to corral and remove most of the spilled oil prevented biologists from predicting the war's long-term effects on local ecosystems (140: 24, 316).

• Federal studies suggested that airborne particulates at levels well below the federal limit may be involved in as many as 60,000 deaths each year in the United States (139: 212).

• One California study showed that high levels of air pollution may induce respiratory symptoms in otherwise healthy adults, while another found indications that the type of pollution typical of Los Angeles may cause lasting, telltale cellular damage in the lungs of youths just 14 years old (139: 203).

• An epidemiologic study of workers at a federal laboratory turned up evidence that long-term exposure to low-level radiation may pose a cancer risk at least 10 times higher than indicated by data on Hiroshima survivors (139: 181).

• Despite new human, animal and cell-culture studies, the carcinogenicity of electromagnetic field exposures remained in question (140: 15, 202, 357).

• Molecular videos revealed why the size of an asbestos fiber plays a role in its toxicity. Another study showed that the carcinogenic fibers can activate an enzyme that triggers cell proliferation characteristic of cancer (140: 180).

• Researchers reported that methyl mercury is building up to toxic levels in the fish of many freshwater lakes and reservoirs (139: 152).

• The Environmental Protection Agency reduced allowable lead levels in drinking water to one-tenth the previously permissible levels (139: 308). The Centers for Disease Control lowered by 60 percent the blood-lead levels considered unhealthy in children (140: 252).

• Scientists asserted that grilled meat constitutes a major and largely ignored source of the tiny, visibility-robbing particles in Los Angeles' air (140: 60).

• Federal researchers developed the first instrument to provide continuous, real-time monitoring of toxic incinerator emissions (140: 189).

• Weed scientists unveiled the "smother plant," the first intentionally developed biological herbicide (139: 175).

• Epidemiologists reported that women drinking highly fluoridated water may face an elevated risk of bone fractures from osteoporosis (139: 335).

• A study suggested that imperceptible formaldehyde levels in mobile homes can aggravate upper respiratory and allergy symptoms (140: 247).

1991

Food Science

• Separate studies in the United States and Scotland indicated that diets high in vitamin E may lower the risk of angina, a form of chest pain that can precede heart attacks (139: 23).

• A Canadian study indicated that skipping breakfast may dramatically increase the stickiness of blood platelets, thereby increasing the risk of a morning heart attack (139: 246).

• Periodic dieting, causing large fluctuations in weight, may harm the heart and lead to premature death (139: 407). One study yielded evidence that obese "yo-yo dieters" may have trouble managing their weight because they experience stronger cravings for sweet, fatty foods than do either lean or stably obese individuals (140: 268). Experiments showed that restricting animals' lifelong diets to only 60 percent of the caloric intake of their hunger-sated littermates not only extended their lifespan by up to 50 percent but also postponed or eliminated virtually all degenerative tissue abnormalities characteristic of aging (140: 215).

• Scientists unveiled an experimental bioassay technique that can simultaneously detect food-borne residues of most pesticides suspected of causing cancer (139: 293).

• A series of animal studies suggested that green tea helps prevent cancers of the liver, lung, skin and digestive tract (140: 133).

• A physician demonstrated that health-conscious cooks can use vegetable oil as a "healthy solvent" to extract up to 40 percent of the cholesterol in ground meat – and to substitute unsaturated fats for many of the meat's naturally saturated ones (139: 22).

• Grape seed oil became the first food shown to raise blood levels of beneficial

high-density lipoproteins (HDLs) (139: 268). Other researchers discovered that when HDLs are allowed to oxidize in the body, they lose much of their ability to clear away cholesterol (140: 237).

• A study suggested that decaffeinated – but not regular – coffee significantly increases blood levels of harmful low-density lipoproteins (140: 165).

• Researchers reported that lead can leach out of crystal and into drinks ranging from wine and brandy to apple juice and infant formula (139: 54). Federal analyses also showed that potentially harmful levels of lead taint some table wines and that lead residues from a cork's seal can contaminate the beverage during pouring (140: 189).

• Scientists found that the oil of the cashew shell fights tooth decay and bacterial infections (139: 191) and that a compound in fermented soy sauce fights stomach cancer in animals (139: 357). Research in humans indicated that diets high in vitamin C, vitamin E and carotenoids – all antioxidants – reduce the risk of lung cancer (140: 237).

• Federal researchers showed that cinnamon, mint oil and thyme inhibit sprouting in stored potatoes (140: 125).

• Food chemists enhanced the natural flavor of apples, pears and bananas by incubating the fruits in an alcoholic building block of their principal flavorant (140: 173).

• A pair of studies suggested that infants like garlicky breast milk but shun breast milk spiked with alcohol (140: 230).

1991

Materials Science

• Taking a step toward optical computing, scientists etched pores into silicon wafers to make them photoluminescent (140: 135). They also made porous silicon light up when zapped with an electric current, achieving electroluminescence (140: 399).

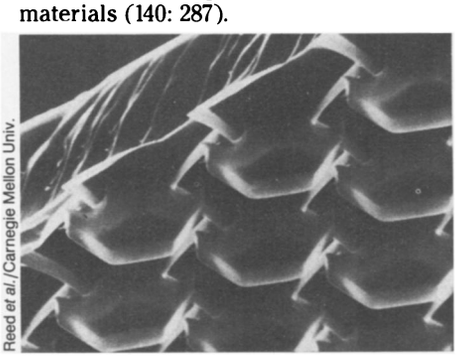
• Scientists thought they had turned gallium arsenide, normally a semiconductor, into a superconductor when they grew this material at low temperatures (139: 372), but they later discovered that indium contamination, not extra arsenic, led to the superconductivity (140: 399).

• Researchers continued to borrow from nature to make new materials. By adding a complex sugar called hydroxyethyl cellulose to mineral saturated solutions, one group made seashell-shaped ceramic material out of calcium carbonate (139: 5). Other scientists created "organoceramic" artificial bone by dispersing organic molecules among inorganic crystals (140: 150).

• Investigators turned up the voltage in ballistic electron emission microscopy (BEEM), rearranging silicon atoms underlying a thin layer of gold (139: 6). Other scientists used scanning tunneling microscopy to ferry silicon atoms (140: 21), and one group used Teflon to form ordered thin films (140: 71).

• Using diamond anvils, scientists put the squeeze on many materials (139: 72), including iron samples, which absorbed hydrogen and expanded (140: 70).

• Materials scientists created a new silicon fastener for use in electronic circuits and biological sutures (139: 132), made a water-loving latex molecule (139: 165), used DNA strands to build molecular scaffolds (139: 246) and produced diamonds made almost entirely of a heavy carbon isotope (140: 287). One investigator developed a reactive silicon atom useful as a building block for new kinds of materials (140: 287).



Reed et al./Carnegie Mellon Univ.

1991

Paleobiology

• Researchers accumulated more evidence that a meteorite or comet slammed into Earth 65 million years ago, causing a significant fraction of existing species to die out. Leaf fossils from a site in Wyoming suggested that a large prehistoric impact occurred in the month of June, followed by a smaller impact within several months (140: 71). Bits of glass found in Haiti provided support for a theory that the impact occurred in the Caribbean region (139: 125). A statistical examination of fossils along the Montana/North Dakota border suggested that dinosaurs died off abruptly there, a finding consistent with the impact theory (140: 293).

• Specimens from a rich fossil deposit in southwest China helped scientists make sense out of some of the stranger creatures that have inhabited Earth (139: 310).

• Specimens of fossilized teeth and bones yielded clues about the lifestyles and diets of dinosaurs and other ancient animals (140: 278, 303).

• Paleontologists debated whether a 225-million-year-old fossil represents the earliest known bird (140: 104).

• Researchers discovered intact protein molecules in the bones of the largest known dinosaur, called seismosaurus, which lived about 150 million years ago (139: 277).

• A newly discovered specimen of *Tyrannosaurus rex* displayed pathologies detailing a life of numerous injuries (140: 303).

1991

Physics

• Researchers established control of certain chaotic systems by continuously making tiny adjustments to a system parameter (139: 60; 140: 229, 239).

• New experimental data hinted at the existence of a heavy neutrino (139: 260).

• Researchers fabricated semiconductor lasers that generate blue-green light (140: 183).

• A team of physicists reported the first observation of electromagnetically induced transparency in a gas (139: 340).

• Supercomputer calculations suggested that the gravitational collapse of certain three-dimensional distributions of matter can lead to the formation of a naked singularity (139: 148).

• Advances in atomic interferometry opened up the possibility of precisely testing various physical theories (140: 158).

• Physicists obtained the first evidence that Planck's constant has the same value in different physical systems (139: 70).

• Researchers took an important step toward constructing a photonic crystal (140: 277).

• Theorists discovered that semiclassical methods for predicting the behavior of a quantum system provide useful results even when the underlying classical mechanics is chaotic (140: 282).

• For the first time, researchers achieved the fusion of deuterium and tritium nuclei in a magnetically confined plasma (140: 308).

• New measurements of neutrinos coming from the sun revealed a deficit that no conventional theory could explain (140: 406).

• Studies of the behavior of waves in disordered media revealed a number of surprising phenomena (139: 182, 248; 140: 59, 200).

• Reinterpretations of existing data provided evidence that antimatter falls with the same gravitational acceleration as ordinary matter (139: 135).

• Researchers added uranium-238 to the list of radioactive atomic nuclei known to display double-beta decay (140: 373).

1991

Science & Society

• The President's fiscal year 1992 budget request called for a hefty $8.4 billion rise in R & D spending – an 8.2 percent jump after accounting for inflation. Defense activities were slated to get about double the increase requested for civilian activities (139: 87).

• President Bush's "National Energy Strategy" legislation, which kicked off a yearlong debate on how to wean the United States from dependence on foreign oil, stalled over two major conflicts: oil drilling in an Alaskan wilderness and auto-efficiency standards (140: 8).

• A federal court ruled that federal contracts cannot prohibit the reporting of preliminary research findings (140: 318).

• Rather than rely on NASA's promise to complete by December 1992 the first of a costly new generation of weather satellites whose development has been plagued with problems, the National Oceanic and Atmospheric Administration announced it would borrow an orbiting satellite from the European Space Agency (140: 5, 68, 207).

• A federally commissioned panel concluded that the federal government's nearly defunct Noise Control Act "is by any measure a public policy failure" and that states have been unable to fill the void left by federal inaction on this issue (140: 100).

• Several unconventional sources of potentially low-level – but long-lived – radioactive wastes have escaped federal regulation (140: 95, 264).

• An appeals court overturned a federally imposed phaseout of asbestos-containing products (140: 318).

• In a draft report, the National Institutes of Health concluded that crucial data underpinning a 1986 scientific report were fraudulent (139: 196). As a result of the controversy, David Baltimore, a coauthor of the 1986 paper, announced his intention to resign as Rockefeller University President effective Dec. 31 (140: 399). Baltimore had previously voiced regret at his formerly vigorous defense of the questionable data (139: 294).

• Geneticists studying the DNA of red wolves found evidence that raises questions about this animal's status as a separate species eligible for protection under the Endangered Species Act (139: 374).

• The House Science, Space and Technology Committee created a new task force to focus on the health of U.S. research, especially in light of new questions about "big" versus "small" science projects (139: 324). Such questions nearly killed funding for one of the largest "big science" enterprises – the $40 billion space station (139: 375).

• A National Institutes of Health report criticized top U.S. and French scientists who collaborated on AIDS vaccine tests in France and Zaire for failing to receive proper U.S. government approval and for not adequately warning their volunteers of the potential risks involved in the vaccine trial (140: 37). The U.S. researchers denied any violations (140: 55).

• Though anti-smoking campaigns appeared to be helping, a survey showed that one in three women of childbearing age in the United States continues to smoke (140: 302). Several studies showed that cigarette advertisements exert powerful psychological influences on children and teenagers, possibly encouraging young people to start smoking (140: 390).

1991

Space Science

• The Jupiter-bound Galileo spacecraft radioed back to Earth the first close-up images ever taken of an asteroid, an object called 951 Gaspra (140: 326, 391).

• Comet Halley, normally dim and quiescent as it recedes from the sun, suddenly sported a new shroud of dust and underwent a major jump in luminosity (139: 133, 373; 140: 239, 318).

• New radar portraits of Mercury, the solar system's hottest planet, suggest that large ice patches may cover its poles (140: 295).

• Astronomers reported that Comet Yanaka (1988r) may belong to a new class of Milky Way comets that might have originally orbited a star other than the sun (140: 309).

• Using infrared, visible-light and radio-wave detectors, scientists took advantage of the July 11 total solar eclipse to study features of the solar atmosphere that show up clearly only when the moon blocks the brilliant light from the solar disk (140: 52).

• A series of spectacular flares erupted from a single region of the sun's surface in June, surprising scientists with their record-breaking brightness (139: 388).

• While blurry optics remained the number-one problem plaguing the Hubble Space Telescope, researchers discovered several other Hubble woes: failing gyroscopes, unwanted vibrations created by the craft's solar panels, and a faulty spectrograph (140: 86, 182). Nonetheless, Hubble captured the sharpest images of Mars ever taken from Earth's vicinity (139: 212), as well as a photo depicting the clouds in Jupiter's turbulent atmosphere, including a tent-like structure – never before imaged – above the Great Red Spot (140: 269).

• Magellan's radar survey of Venus found thousands of small volcanoes dotting the mostly flat landscape, as well as mountainous volcanic structures several hundred kilometers in diameter and evidence of massive outpourings of lava (139: 229). Other Magellan images revealed that Venus contains the solar system's longest known channel (140: 149).

• The Galileo spacecraft found strong evidence of lightning on Venus (140: 239). In addition, Galileo images offered an unprecedented view of the entire Antarctic continent as seen from above the South Pole (140: 311).

• Both heating and cooling failed to open the main antenna aboard the Galileo craft. If the umbrella-shaped antenna remains jammed, Galileo will relay to Earth only a small fraction of the data it will collect during its two-year visit to Jupiter (140: 79).

• Analyzing properties of the organic haze shrouding Saturn's largest moon, researchers found evidence of the first anti-greenhouse effect known in the solar system (140: 167).

• An astronomer proposed that some 1,000 as-yet-unseen "ice dwarfs" – tiny planets with the size, mass and chilly surface temperatures of Pluto – orbit the sun at the outskirts of the solar system (140: 184).