

SCIENCE NEWS

of the Year

Change happens – sometimes for better, sometimes for worse – and 1993 saw significant changes within the sciences.

As the following pages succinctly demonstrate, many fields of research again produced bumper yields. Take your pick; pick your favorites, from anthropology to space science. For those of us who find science and discovery an exciting adventure, 1993 produced many intriguing additions to the body of human knowledge.

Yet we witnessed, as well, a major shift – within Congress and within the Clinton administration – in the allocation of federal research funds. The result: a shift in science policy at least as significant as that wrought in the first two years of Ronald Reagan's presidency, when funds for applied research plummeted in favor of increased support for basic science.

Now, it seems, the money engine that propels so much university research may be thrown into reverse. The new thrust is toward "strategic" research, a euphemism that signals renewed emphasis on directed and applied work, to the detriment of basic research dollars.

This year saw the death of the Superconducting Super Collider (SSC) and the near-death, again, of the space station. While Congress let the SSC expire, the Senate resuscitated the space station, at least for another year. Still, the message seems clear to those who favor huge, costly new science projects: In this time of taxpayer disaffection and budget deficits, forget it.

Equally troubling to those who believe in basic research is the greater emphasis on federal funds for applied and industrial research. "Technology" seems to resonate more than "science" today, as the administration pursues policies to make the United States more competitive. A Senate committee told the National Science Foundation (NSF) to use 60 percent of its research funds in fiscal 1994 for "strategic and applied" work. And in a scheme more threatening to basic research, a bipartisan group in Congress wants to cut \$2 billion in science expenditures.

Clearly, those seeking to understand the fundamental ways in which the world works will not be cut off without a dime. But as NSF Director Neal Lane told a group of science writers last month, basic research faces some tough years ahead. The wisdom with which the federal government and the scientific community resolve the issue will determine our competitiveness not just for the immediate future, but for decades ahead.

– Patrick Young

A n t h r o p o l o g y

- Three partial skulls found in a Spanish cave provided evidence that an early phase of Neandertal evolution began at least 300,000 years ago (143: 228).

- Investigators who found 3.4-million-year-old remains of the earliest known species in the human evolutionary family asserted that these creatures spent most of their time on the ground and adapted to diverse African environments (144: 324).

- The discovery of four ancient mountain towns in Belize indicated that Central America's Maya civilization employed regional trading networks more than 1,000 years ago (144: 84). Another Belize site yielded the earliest known Maya burials, dating to 3,000 years ago (144: 212).

- Two investigators reported that they had deciphered much of the earliest known readable text in the Americas, a story of politics and warfare carved into a 4-ton stone

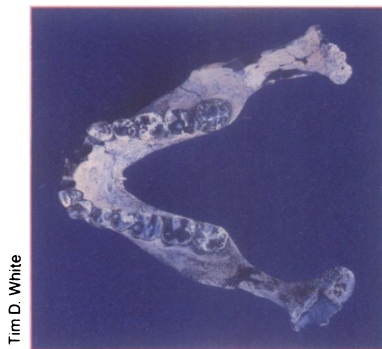
that dates to A.D. 159 (143: 180).

- An approximately 2.4-million-year-old fossil jaw from a direct human ancestor unearthed at an African site supports the notion that the *Homo* lineage originated in the eastern portion of the continent and moved south as global temperatures climbed (144: 277).

- A controversial mitochondrial DNA analysis of ancient population expansions and separations suggests that modern humans moved out of Africa beginning around 100,000 years ago, with far-flung groups experiencing dramatic growth in numbers around 50,000 years ago (144: 196).

- Human bones at a 900-year-old Colorado site yielded signs that prehistoric Anasazi Indians occasionally practiced cannibalism, a conclusion that sparked debate (143: 12).

- Archaeologists identified a 9,000-year-old piece of material found at a site in Turkey as the oldest known fragment of cloth (144: 54).



Tim D. White

Jaw from 3.4-million-year-old human ancestor.

- Two teams of astronomers reported evidence that the Milky Way contains Jupiter-size chunks of dark matter known as Massive Compact Halo Objects (144: 199).

- Measuring for the first time the motion across the sky of a galaxy other than our own, scientists presented a more accurate estimate of the amount of dark matter believed to be contained in the Milky Way (143: 374).

- Some researchers proposed that the gamma-ray-emitting pulsar Geminga, created in a supernova explosion, may have sculpted the huge void in space in which our sun and some nearby stars reside (143: 4). Others suggested that several supernova explosions collectively formed the misshapen void (143: 326).

- Astronomers presented the first images made with the world's largest optical telescope, the 10-meter W.M. Keck atop Hawaii's Mauna Kea (143: 388).

- Astronomers discovered the brightest supernova to appear in the northern sky since 1937 (143: 246). The changing pattern of light emission from the stellar explosion, dubbed SN 1993J, suggests it may be a link between two types of supernovas (144: 15).

- For the first time, astronomers caught a cloud of gas and dust in the act of making a star (143: 156).

- Many infant, low-mass stars possess disks of dust that have the potential to form planets, astronomers found (143: 36).

- A study suggested that stars with a slightly lower mass and surface temperature than the sun have an equally good chance of forming life-sustaining planets (143: 74).

- New data from NASA's Cosmic Background Explorer satellite bolster the notion that the universe began with a Big Bang, researchers said (143: 43).

- The X-ray satellite ROSAT found evidence that small groups of galaxies contain a surprisingly high proportion of dark matter (143: 20).

- Cosmologists proposed that a combination of hot and cold dark matter may best explain the structure of the universe (143: 328). Other researchers suggested a single mechanism that might have generated both hot and cold dark matter in the early universe (144: 69).



Supernova 1993J.

B e h a v i o r

- Researchers found that an inability to express hostility and the lack of a sense of time urgency often prove fatal to female heart-attack survivors (144: 244). Evidence also suggested that severe depression hastens death among heart-attack survivors of both sexes (144: 263). Even mild to moderate depression showed signs of increasing the risk of contracting and dying from heart disease (144: 79).

- A national survey found that 28 percent of U.S. adults — more than 44 million people — suffer from mental disorders and drug abuse or dependence, but fewer than one in three seeks help for these problems (143: 134).

- A 50-year study of alcoholic men indicated that depression rarely leads to uncontrolled alcohol use, although alcoholics often get depressed, and suggested that hard-core alcoholics stand the greatest chance both of giving up the bottle and of dying young (143: 356).

- Longitudinal tracking of teenagers revealed that a healthy regard for oneself develops differently in boys and in girls and that reports of high self-esteem do not necessarily reflect psychological health (143: 308).

- Based on new studies of beginning readers, psychologists argued for individualized reading instruction that incorporates phonics, a "whole language" emphasis on reading and writing stories, and mental strategies for effective reading (144: 132).

- Researchers found that memory for some events may extend back to age 2 (143: 372). Another study suggested that people place undue confidence in "flashbulb memories" associated with startling public events (143: 166).

- An analysis of death records in California indicated that deeply held beliefs related to disease significantly influence the survival times of people who develop most major illnesses, including cancer, heart disease, and emphysema (144: 293).

- Debate raged over the veracity of memories of alleged childhood sexual abuse recalled after years or decades of amnesia (144: 184). Researchers also explored possible connections between childhood sexual abuse and various psychological problems later in life (144: 202).

This is a review of important science news stories of 1993 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 (Vol. 143 is Jan.-June; Vol. 144 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.



Bob Gress

Barn owl.

- Researchers homed in on genes — and in some cases the defective protein for which a gene codes — for familial forms of glaucoma (143: 376); an inherited form of amyotrophic lateral sclerosis (ALS) (143: 5, 148; 144: 116); colorectal cancer (143: 292; 144: 388); Wilms' tumor (144: 148); Menkes' syndrome (143: 30); xeroderma pigmentosum (143: 309); Hirschsprung's disease (144: 174); and Canavan's disease (144: 234). A controversial study found that inheriting one or more as yet unspecified genes in a small area of the X chromosome may help predispose some men to homosexuality (144: 37).
- Three research groups fingered a gene that links p53, a tumor suppressor gene, to uncontrolled cell growth (144: 356).
- Scientists traced spinocerebellar ataxia (144: 20) and some cancers (144: 189) to defective genes that vary in the number of repeating triplets of base pairs they contain. Other cancers seem to arise from unstable genomes (143: 356) that may result from aging DNA repair mechanisms (143: 135).
- With new antibodies, neurobiologists traced the migration of embryonic neurons (144: 308). Researchers clarified how owls see (144: 133) and how nerves connect (144: 68).
- Genetic engineering helped scientists identify a key docking site for allergy antibodies (144: 389) and a shared component of docking sites for immune messengers (144: 404).
- Studies indicated that melatonin, a hormone secreted by the brain, protects the body from biologically damaging free radicals more effectively than any other chemical known (144: 109) and that microglia, immune cells in the brain, can generate free radicals and other toxic substances (144: 378).
- Mice with yeast artificial chromosomes opened up new possibilities for genetics research (143: 360).
- Evidence continued to build for the biological roles of addictive substances. Scientists reported finding a natural marijuana-like substance manufactured by the brain (143: 88). Researchers also identified a receptor for this substance on human immune cells (144: 165).
- Studies showed that cheetahs and beavers (144: 200, 235) can thrive despite inbreeding.
- Conservationists have developed strategies for preserving biodiversity (144: 168, 248).
- The efforts of structural biologists continued to pay off, with images of cyclosporin-enzyme complexes (143: 21), the binding of MHC molecules to protein fragments (143: 72), and the initial steps in unwinding DNA (144: 247), as well as new knowledge about water's role in enzymatic reactions (143: 121).
- Scientists made strides in understanding the structure and actions of myosin and kinesin, molecular motors critical for muscle and cell movements (144: 4, 316).
- Technical advances enabled scientists to monitor chemicals moving through cells (143: 8) and to show how RNA works in cell nuclei (143: 188). Other new techniques promise to speed gene mapping (143: 294; 144: 164).
- Evolution studies showed that insects diversified before their plant hosts (144: 38).
- Scientists demonstrated how plants repair DNA (144: 198), use cellular signal systems similar to animals' (143: 103), can be transformed by fungi (143: 164), and protect themselves from pathogens (144: 103).

B i o m e d i c i n e

- For the first time, researchers "cloned" human embryos, triggering a host of ethical concerns (144: 276). Doctors developed an *in vitro* fertilization technique that enables women in their fifties to give birth (143: 100).
- Scientists identified a gene that warns of increased risk of late-onset Alzheimer's disease (144: 108). Researchers reported that a skin test may prove helpful in diagnosing this tricky neurological disorder (144: 151).
- Researchers said they slowed the life-threatening complications of type I diabetes by controlling blood sugar (143: 388). Scientists said an enzyme may prove responsible for the autoimmune attack that causes this disease (144: 292). A high-blood-pressure drug showed its prowess against the kidney disease that afflicts many people with type I diabetes (144: 311).
- Researchers discovered that older men with slow-growing prostate tumors may get little benefit from surgery or radiation (143: 367). Two controversial reports raised concerns about whether vasectomy increases the risk of prostate cancer (143: 116).
- Several studies cast doubt on mammography's survival advantage for women age 40 to 49 (143: 149). Computer

scientists developed digital imaging methods that detect breast tumors missed by conventional mammography (143: 392).

- Public health experts expressed concern about the spread of drug-resistant tuberculosis, a disease especially lethal for people with AIDS (143: 90, 261).
- Two research teams reported that the AIDS virus actively replicates in lymph nodes during the symptomless stage of HIV infection (143: 196). Another report indicated that HIV destroys immune system cells before they get a chance to mature (143: 406).
- Neuroscientists reported that mammals repair damage to specialized hair cells in the inner ear, holding out hope for people with hearing loss (143: 164).
- Epidemiologists found that on-the-job stress puts people at risk of colorectal cancer; a separate team discovered DNA damage, which can lead to cancer, in psychologically stressed laboratory rats (144: 196).
- A regimen that employs drugs, diet, and exercise can ease mild hypertension and ward off heart attacks or strokes, researchers reported (144: 100). Scientists indicated that aerobic workouts may keep the blood vessels flexible, thus preventing age-associated hypertension (144: 246). A team reported that a shortage of the gas nitric oxide may cause some cases of high blood pressure (143: 327).
- Investigators discovered that the flu-like illness that first surfaced in several Southwestern states is caused by a type of hantavirus (143: 374; 144: 116).
- Investigators reported that a family history

of breast cancer may confer a smaller risk than previously believed (144: 52).

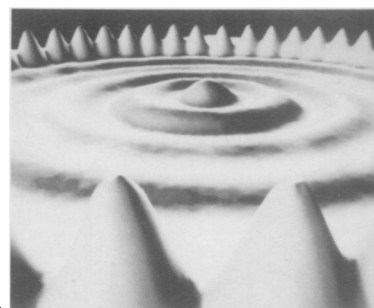
- Studies reported that tamoxifen — a drug used to prevent breast cancer — causes liver tumors in rats (144: 181) and unusually lethal uterine cancers in women (144: 207).
- Federal scientists found that the amount of artery-clogging cholesterol in the collective U.S. bloodstream continues to decline (143: 390).
- While far from developing a vaccine for people with AIDS, scientists developed an experimental vaccine that protected monkeys from vaginal transmission of an HIV-like virus (143: 340).
- A federal panel gave the nod to a pair of gene therapy protocols for people with AIDS (143: 372). Two studies indicated that a type of sulfa drug helps prevent life-threatening pneumonia in people with AIDS (143: 21).
- A study suggested that mercury-based dental fillings may play a role in the spread of drug-resistant bacteria (143: 230).
- Researchers concluded that people who are not infected with HIV but who show symptoms of an immune illness suffer from a collection of disorders (143: 119).
- Scientists showed that certain calcium supplements contain lead, a metal that poses a health threat to children (144: 150).
- Neurologists reported that a genetically engineered drug slows the progress of some types of multiple sclerosis (143: 197); an eye study showed steroid shots may slow MS onset (144: 390).

C h e m i s t r y

- A newly invented femtosecond field emission camera showed in real time the continuous vibrations of a single molecule (144: 326).
- A common polymer electrolyte revealed its helical structure, making possible better charge-holding plastics (144: 293).
- Scientists created artificial atoms by confining electrons inside a crystal to a space only a few angstroms wide (143: 118).
- Chain-like polymer molecules proved to move in a snake-like manner, confirming experimentally what theory predicted (144: 182).
- Scientists created antibody mimics for detecting minute amounts of substances in the body (143: 132).
- Electrons confined to a small, flat quantum

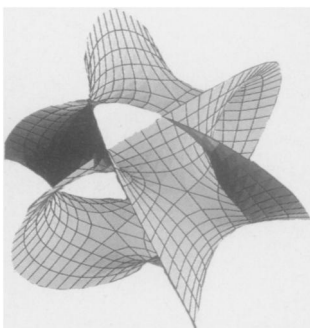
corral produce standing waves, confirming a prediction of quantum theory (144: 228).

- Fullerenes, when exposed to visible or ultraviolet light under certain conditions, will form polymer thin films (143: 119).
- A specially tailored buckyball, designed with the aid of advanced computer models, blocked an HIV enzyme (144: 87).
- Using a newly invented catalyst, organic chemists produced complex chiral molecules from nonchiral starting materials (143: 6).
- Oxidative damage to tissues shortens the life span of flies, suggesting that aging may result from accumulated oxidative damage (144: 109).
- A speck of glass can hold an entire electrophoresis system, making it possible to fit a complete chemical analysis lab on a chip (144: 100).



Electron standing waves in a quantum corral.

IBM/Almaden Research Center



Fermat equation curve.

- In a dramatic announcement that caught the mathematical community by surprise, Andrew Wiles revealed that he had proved major parts of a conjecture in number theory, which in turn established the truth of Fermat's last theorem (144: 5, 406).
- Researchers demonstrated the first general-purpose optical computer (143: 63).
- Fierce debate erupted over government proposals calling for the adoption of a "key-escrow" cryptographic scheme as a federal standard (143: 394; 144: 143).
- Tackling the "party" problem in Ramsey theory, two researchers used computers to establish that 25 is the minimum number of guests needed to guarantee that a party includes at least four people who know one another and at least five who are strangers to one another (144: 46).
- The first research conference devoted to the reverse engineering of software highlighted the growing difficulty of deciphering antiquated computer programs (144: 88).
- Demonstrations of automated translation of spoken words and a workstation-based speech-recognition system that could handle a 20,000-word vocabulary showed how far this technology has progressed (143: 222; 144: 254).
- Concerns about the security and accuracy of automated systems for registering and counting votes prompted discussions at a federal computer-security conference (144: 282).

E a r t h S c i e n c e

- Studies of ice at the bottom of Greenland's glacial cap revealed that Earth's climate has a habit of changing rapidly and is therefore less stable than previously thought (144: 36).
- The ozone layer around much of the planet showed record thinning in 1992 and early 1993, perhaps resulting in part from the lingering effects of the Mt. Pinatubo eruption in 1991 (143: 260).
- Geophysicists discovered that the strength of Earth's magnetic field rises and falls with a distinct pattern that can help explain why the field occasionally flips its polarity (144: 327).
- The El Niño warming in the tropical Pacific persisted much longer than anticipated and disrupted weather patterns around much of the globe (143: 53, 292; 144: 329).
- Experiments with computer models of Earth suggested that rock from the planet's surface may periodically cascade into the lower mantle, causing partial, but not wholesale, mixing of the mantle (143: 133).
- A seismologist discovered an apparent pattern in the way Earth releases energy through great earthquakes (143: 404).
- Ecologists in Alaska found that rising temperatures there may have spurred the Arctic tundra to begin releasing carbon dioxide gas, contributing to the threat of global warming (143: 100).
- Oceanographers for the first time detected and monitored an undersea eruption from the volcanic rift that winds through the world's ocean basins. The eruption occurred off the coast of Oregon (144: 132).
- The ozone hole that formed over Antarctica in September 1993 set a record as the deepest ever observed (144: 247).
- Scientists flying over Antarctica discovered under the thick ice sheet signs of an active volcano, which may play a role in doomsday scenarios of rapidly rising sea levels (143: 104).
- Researchers drilled into a part of the ocean floor where Earth's mantle is exposed and collected rocks that help explain how molten lava from the mantle forms the ocean crust covering two-thirds of the planet's surface (143: 117).
- Analysis of the pores of fossilized leaves provided a record of how carbon dioxide concentrations in the atmosphere have waxed and waned with global temperatures in the last few million years (144: 140).
- An investigation of millennia-old pine trees suggested that flickerings in the sun's brightness altered Earth's climate in the past and could slow or speed the pace of global warming (143: 148).
- Researchers began testing new techniques for forecasting general weather conditions up to a year in advance (144: 328).
- Critics charged that the \$1.5 billion U.S. Global Change Research Program has failed to address the kinds of issues that will help political leaders fashion policy concerning global warming and other environmental threats (144: 158).

- President Clinton unveiled the Climate Change Action Plan, a comprehensive package of energy conservation and other measures aimed at bringing U.S. emissions of greenhouse gases back to 1990 levels by the year 2000 (144: 263, 287).

- New studies identified a diverse range of environmental agents – from foods and combustion pollutants to electromagnetic fields – that may foster breast cancer by boosting concentrations of estrogen or estrogen-like substances in the blood (143: 262; 144: 10).

- While many beaches and wildlife populations appear to have recovered from the *Exxon Valdez* spill, some notable exceptions were visible even four years later (143: 102, 110, 126, 200, 302). A diverse group of research teams also unveiled a host of new technologies for studying and cleaning up spilled oil (143: 253, 266, 294, 332; 144: 220).

- The National Academy of Sciences linked three cancers and two other disorders in U.S. servicemen to their exposure in Vietnam to dioxin-tainted herbicides (144: 70). Scientists found an excessive number of cancers among people living downwind of an industrial accident that caused the highest reported human exposures to dioxin (144: 149).

- Studies linked respiratory and neurological problems to working at or living downwind of hazardous-waste incinerators (143: 334).

- Researchers linked increases in hospital admissions for respiratory ailments to increases in outdoor concentrations of acidic aerosols – droplets that form from combustion emissions (143: 52).

- Winds can transport ground-level ozone (smog) from North America to Europe, one study found (143: 151). Another showed that ozone concentrations typical of bad days in many urban areas can injure the airways of even healthy adults (144: 326).

- Andean mountain forests – unparalleled in their diversity of herbs, shrubs, mosses, and epiphytes – are disappearing far faster than Amazon rain forests, scientists reported (144: 23).

- Research on animals identified trihalomethanes – by-products of water chlorination – as the likely agents in drinking water responsible for bladder and rectal cancers (143: 343).

- Studies indicated that much of the 124 million tons of organic garbage from U.S. households each year can be composted (143: 56).



NOBE

Burning oil spilled at sea.

Food Science

- Children may be ingesting unsafe quantities of pesticide residues on food, two studies reported (144: 4). The Clinton administration responded by revamping federal pesticide policies (144: 219).

- Two chemicals in the brain appear to foster food cravings – one for fats, the other for sweets, research on animals showed (144: 310).

- Diets high in fat may cause the body's blood-clotting system to become overly aggressive, thereby fostering heart attacks, a new study showed (143: 77). High-fat diets also appeared to increase the likelihood that prostate cancer would spread, a large study found (144: 228).

- Consumers can reduce their serum cholesterol concentrations – without cutting calories – by eating smaller, more frequent meals, New Zealand researchers showed (143: 165).

- Folate and methionine may be two of the

ingredients in fresh fruits and vegetables responsible for these foods' ability to protect against colorectal cancer, a new study indicated (143: 358).

- Supplementing premature babies' formulas with a fat from fish oil can sharpen their visual acuity, studies showed (144: 38).

- Tea and other foods rich in flavonoids – plant pigments with antioxidant properties – appeared to lower heart attack risk in elderly men (144: 278).

- The Clinton administration agreed to enforce the Delaney clause – a food-safety-law amendment that prohibits the sale of processed foods containing higher concentrations of carcinogens than existed in the raw ingredients (143: 311).

- Wooden cutting boards appear to resist bacterial growth better than their plastic counterparts, Wisconsin microbiologists reported (143: 84).

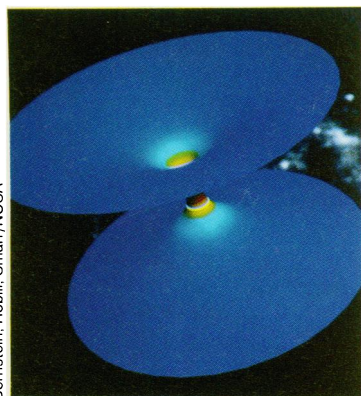
- Superconductivity can occur above 153 kelvins at 150,000 atmospheres of pressure (144: 214); it may occur at 250 kelvins without pressure, French scientists reported (144: 405).
- Polymer electroluminescence has become efficient enough to make plastic light-emitting diodes potentially useful (144: 246).
- A new type of sulfur-aluminum battery made a strong showing as a possible rechargeable energy system for electric vehicles (144: 151).
- Scientists can now make longer, stronger nanotubes of carbon atoms only a few nanometers wide and up to 3 micrometers long (143: 214).
- A micrometer-scale steam engine perched on a silicon wafer can deliver 100 times more power than electrostatic motors of the same size (144: 197).
- Waste plastics can yield good-quality fuel oil, thanks to new methods of extracting oil efficiently from common refuse (144: 134).
- Photonic crystals, which stop absorption or emission of radiation at certain wavelengths, may lead to better lasers and solar cells (144: 199).
- Nanowires, virtual strings of atoms only a few nanometers thick, may make possible better magnetic films and recording devices (144: 167).

P a l e o b i o l o g y

- U.S. and Argentine researchers discovered the most primitive known dinosaur, a dog-size carnivore named *Eoraptor* that lived roughly 230 million years ago and that offers clues to the rise of the dinosaurs (143: 60).
- Geologists learned that the evolution of complex animals 530 million years ago — an event known as the Cambrian explosion — took place over an extremely short period of geologic time (144: 148).
- A paleontologist found what appears to be the remains of photosynthetic bacteria in 3.5-billion-year-old rocks, suggesting that oxygen may have begun accumulating in the atmosphere far earlier than scientists had previously believed (143: 276).
- Researchers strengthened the link between a huge impact crater in Mexico and the mass extinction at the end of Earth's cretaceous period (143: 212). They also showed that a crater in Iowa was unrelated to that event (144: 279).
- A study of the oldest known bird, the 150-million-year-old *Archaeopteryx*, revealed that it had claws similar to those of a perching bird, contradicting a popular theory about how avian flight developed (143: 87).
- Paleontologists discovered the first known dinosaurs from the Antarctic mainland, including a beast with a strange head crest (144: 261).

P h y s i c s

- Congress rejected further funding for the Superconducting Super Collider, shutting down the \$11 billion project and throwing particle physics into turmoil (144: 45, 276).
- The Stanford Linear Accelerator Center was chosen as the site of a new research facility known as the B Factory (144: 245, 319).
- Researchers demonstrated a new technique for channeling high-intensity laser pulses through a gas for surprisingly long distances (144: 212).
- Physicists obtained experimental evidence clearly demonstrating the existence of the elusive Casimir-Polder force, a subtle quantum effect arising out of fluctuations of electromagnetic fields in a vacuum (143: 102).
- Two teams of physicists experimentally determined the rate at which alpha particles fuse with carbon-12 nuclei, a crucial parameter in determining the fate of massive stars (143: 261).
- New calculations revealed that gravitational waves may carry more information about black holes and other wave sources than researchers had expected (143: 408).
- Researchers succeeded in using intersecting laser beams to hold atoms in place to create two- and three-dimensional optical crystals (143: 315).
- The operation of new storage rings in Europe and an improved electron-beam ion trap permitted studies of highly charged heavy ions (143: 287; 144: 324).



Black hole spacetime.

Bernstein, Hobill, Smarr/NCSA

- President Clinton used his first federal budget blueprint to revise the mission of several research and development agencies: The Energy Department would downplay nuclear programs, NASA would reemphasize aeronautics, and the National Institute of Standards and Technology would focus even more on funding “high-risk, high-payoff” programs (143: 246).

- The filing of applications to patent gene fragments has begun affecting not only the willingness of genetic researchers to collaborate, but also the speed with which research advances can be translated into diagnostic and therapeutic tools, scientists reported (144: 154).

- A presidential panel concluded that research-intensive universities should make some “painful” decisions — such as eliminating or downsizing many departments — to maintain quality during today’s slow economy (143: 31).

- A Department of Health and Human Services investigation concluded that Robert

C. Gallo committed scientific misconduct in connection with his codiscovery of the AIDS virus (143: 20). The charges against Gallo were dropped after an appeals board cleared Gallo colleague Mikulas Popovic of scientific misconduct charges (144: 383).

- In July, the Nuclear Regulatory Commission dropped licensing-fee exemptions for university research reactors. The high and largely unexpected fees threatened to force a closing of most of the 37 reactors (144: 101).

- Rundown or obsolete facilities at many federal labs hamper much government research, a congressionally sponsored study found (144: 213).

- The Supreme Court ruled that research data and interpretations need not be peer-reviewed or published to be used in adjudicating legal claims (144: 63).

- President Clinton selected physicist John H. Gibbons as his science adviser (143: 7).

Space Science

- During a record five walks in space, astronauts attempted to fix myriad problems with the Hubble Space Telescope. But NASA won’t know until February whether Hubble’s flawed optics have indeed been corrected (144: 296, 389, 406).

- Astronomers proposed that five small objects found beyond the orbit of Neptune may be residents of or escapees from the elusive Kuiper belt, a purported storehouse of short-period comets (143: 231; 144: 230).

- Scientists discovered a group of some 18 luminous fragments, lined up like pearls on a string, from a comet that broke up near Jupiter last year (143: 231). The pieces will probably plunge into Jupiter next July, generating a series of spectacular explosions and perhaps creating a new dust ring around the planet (143: 410; 144: 260, 297).

- NASA lost contact with the Mars Observer spacecraft just days before it was to begin orbiting the Red Planet (144: 134, 149).

- In the latest redesign plan for the space station, NASA would build the craft in collaboration with the Russians (144: 206, 399).

- Astronomers reported that they may have found a new class of near-Earth asteroids (143: 117).

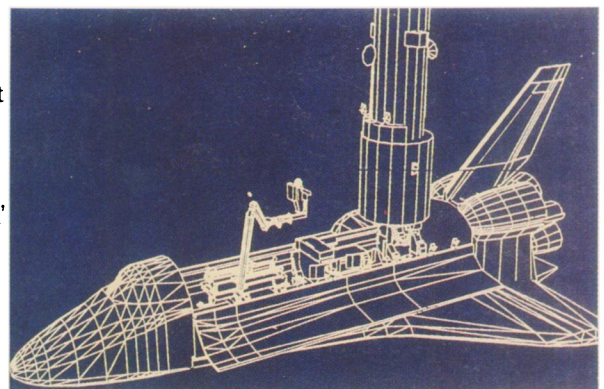
- The Galileo spacecraft radioed to Earth a high-resolution portrait of the asteroid Ida, only the second asteroid ever photographed close-up (144: 215). The craft found that the solar wind’s magnetic field changed direction several times near Ida, but it remains unclear whether the asteroid has its own magnetic field (144: 300).

- Two spacecraft detected bursts of radio waves that may pinpoint the edge of the solar system (143: 342).

- Observations revealed that Neptune’s northern hemisphere is brighter than its southern, a phenomenon never before detected (144: 287).

- New calculations indicated that planets like Jupiter and Saturn may be rare in planetary systems but that their presence in ours ejects or deflects many comets that might otherwise decimate life on Earth (143: 198).

- Venus may once have had an ocean as deep as 25 meters, according to a reanalysis of data from the Pioneer-Venus spacecraft (143: 212).



Space shuttle crew repaired Hubble Space Telescope.