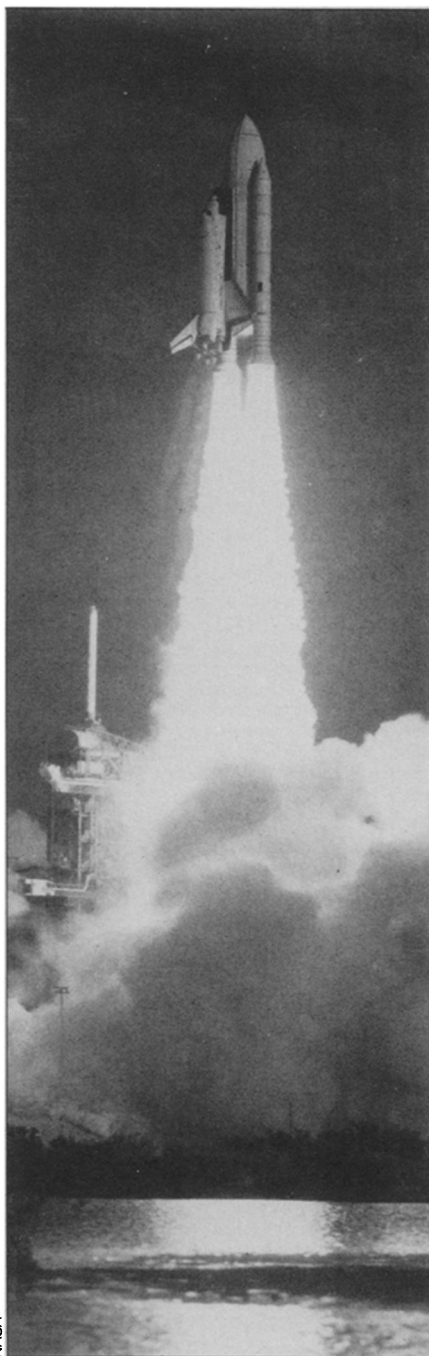


Science News of the Year

This is a review of important science news stories of 1981 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. 119 is Jan.-June; Vol. 120 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 75 cents each by writing to SCIENCE NEWS, 1719 N Street, N.W., Washington, D.C. 20036.

Space & Astronomy

- The U.S. space shuttle successfully made its first orbital flight (119: 244), followed by a second flight whose success was marred by a faulty fuel cell that shortened the mission by more than 50 percent. 120: 324
- In the last U.S. interplanetary encounter for half a decade (120: 136), the Voyager 2 spacecraft flew past Saturn, revealing a host of new details including the finding that the planet's rings are far more complex than even Voyager 1 in 1980 had indicated. 120: 132, 148, 164, 182
- A deuterium-to-hydrogen ratio measurement provided the first direct evidence that the early atmosphere of Venus may have contained at least 1.5 percent water. 120: 372
- The most distant galaxies yet found were shown to be about 10 billion light-years away and appear very mature for being only about 8 billion years old. 119: 148
- The Einstein orbiting observatory discovered, contrary to general expectation, that stars are generally bright sources of X-rays. 119: 281
- The mass of a star in the Tarantula nebula was determined to be about 3,000 times that of the sun, making it the heaviest ever calculated. 119: 36
- Evidence gathered by radio astronomers supported previous optical results indicating that the gravitational lens effect may actually exist. 119: 166
- The suggestion that quasars may be gravitational lens images of other bodies was receiving serious discussion. 120: 325
- The Saturnian moon Tethys was confirmed by earth-based observations to have two other satellites oscillating near the L_4 and L_5 libration points in its orbit. 119: 341
- In the year's only interplanetary launchings, the Soviet Venera 13 and 14 spacecraft were sent toward early 1982 landings on Venus. 120: 308
- The Solar Mesosphere Explorer satellite was placed in earth orbit by NASA for de-



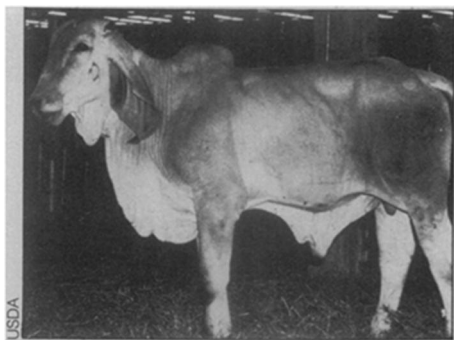
The first orbital flight of the space shuttle, launched April 12, highlighted a year in space that also saw the last U.S. planetary encounter for half a decade.

tailed studies of the sun's effect on the formation and destruction of ozone in earth's upper atmosphere. 120: 229

- Two Dynamics Explorer satellites were launched to probe earth's magnetosphere from high and low altitudes in the same orbital plane, often enabling them to study different points on the same magnetic field line. 120: 84
- The European Space Agency's Ariane rocket was launched on a successful third flight, setting the program back on track after a 1980 second liftoff that ended in a midair explosion. 119: 404
- Two Soviet cosmonauts spent 75 days in space, most of it aboard the Salyut 6 space station, during which time they were visited by two other duos, making a total of 18 crews that had visited the much-used station. 119: 196, 341
- While administration budget cuts raised scientists' fears that U.S. interplanetary missions might be coming to an end (120: 260), the growing grassroots pro-space movement continued to develop. Activities in the private sector included \$60,000 in donations to the Viking Mars project (119: 36), initial steps toward an earth-orbiting astronomy satellite to be run by ham radio and TV (119: 151), test-deployment of a prototype solar sail for a mid-1980s mission (120: 328) and an unsuccessful test of a rocket designed to compete with NASA's shuttle and Europe's Ariane.
- Photos from a Defense Department research satellite revealed that in 1979 a previously unknown comet apparently collided with the sun. 120: 244
- A laboratory devoted solely to studies of cosmic dust was established by NASA. 119: 216
- A method for grinding optical mirrors in the shape of off-axis paraboloids has been developed, opening the way to construction of large segmented mirrors. 120: 197
- Two technicians were killed by toxic fumes during a ground test of the space shuttle, the only fatalities aboard a U.S. spacecraft since the Apollo fire, also during a ground test, that killed three astronauts in 1967. 120: 23

Biology

- An effective vaccine against foot-and-mouth, a severe, highly contagious animal disease, became the first vaccine to be produced by recombinant DNA technology. 119: 150, 405
- Embryo transplant at the Bronx Zoo allowed a common dairy cow to give birth to a gaur, a rare wild ox, in the first successful use of a domestic animal as a surrogate mother for a vanishing wild species. 120: 116



- A functional gene was transferred between mammalian species; a rabbit blood protein was produced by a small number of mice receiving the gene and by their offspring. 120: 164
- Genetic engineering began to be applied to crop improvement. Scientists transferred the gene for a major seed storage protein from French beans into cells of sunflower. In other work the complete set of 17 genes that control nitrogen fixation was transferred from a bacterium to a yeast. 120: 23; 119: 119
- Giant tube worms living around hot-water vents on the ocean floor were found to be "autotrophic animals," capable of synthesizing their own food from inorganic material with the help of internal bacteria. 120: 38



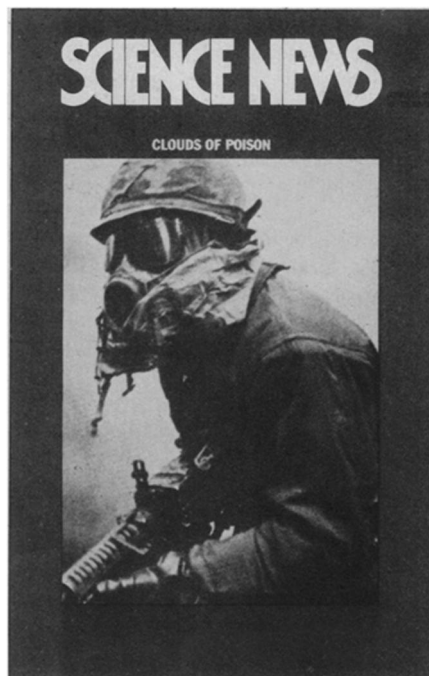
- The search for mechanisms of "quantum jumps" of evolution focused attention on embryology and development. 120: 12

- Excitement about a new model for the basis of cancer was suddenly dampened by evidence that key experiments had been falsified by a graduate student. 119: 180; 120: 165
- Many biologists began using video equipment to improve the contrast, sensitivity and quality of images viewed with a light microscope. 119: 234
- A new technique was developed for recording electrical activity of cell membranes. It allows scientists to analyze the activity of single membrane channels. 120: 295
- Scientists intensified efforts to learn about therapsids or mammal-like reptiles which dominated animal life before the era of the dinosaurs and which gave rise to all mammals. 119: 389
- Genetically engineered yeast containing the gene for hepatitis B coat protein were found to produce a complex protein, sugar and fat structure that resembles the immunizing particle in the blood of patients. 120: 84
- Small amounts of morphine were detected in both human and cow milk. Plants in the diet were thought to be the most likely source. 120: 149
- Clones of zebra fish—more than 50 different groups of up to 200 genetically identical fish—were produced by University of Oregon biologists. 119: 373
- British scientists assembled 514 paired nucleotides to make a synthetic gene for interferon. It was the longest gene to be pieced together in a laboratory. 120: 149
- The sequence of the 7,433 nucleotide subunits of poliovirus was determined. 120: 6
- A Canadian biotechnology firm became the first to market a machine for synthesizing specific sequences of DNA. 119: 69
- The National Institutes of Health found two investigators in violation of the recombinant DNA guidelines. In September the NIH Recombinant DNA Advisory Committee proposed the elimination of all regulatory aspects of the guidelines. 119: 198, 357; 120: 180, 375

Chemistry

- The U.S. Environmental Protection Agency continued to sort through thousands of questionable health effect studies—conducted by Industrial Bio-Test Laboratories (IBT)—that supported the registration of pesticides and maximum permissible residue levels of pesticides. Meanwhile, four former IBT employees were indicted by a federal grand jury on counts of giving false documents to the government and mail and wire fraud. 120: 11

- The U.S. State Department presented sketchy evidence that portions of South-east Asia and Afghanistan were sprayed with yellow clouds of a Soviet-supplied fungal toxin chemical weapon. 120: 250, 327



- The widely accepted recipe for the earth's primordial soup was challenged for the first time in 30 years when origin-of-life chemists reported that the primitive atmosphere may *not* have been rich in hydrogen. 119: 72, 376
- Successes in syntheses included the 8-year, 49-scientist triumph in producing the antibiotic erythromycin (120: 140); the component-fusing approach to synthesizing aklavinone, a portion of a drug that promises to be effective in cancer treatment (120: 140); and Leo A. Paquette's construction of the first 12-sided, 20-cornered hydrocarbon structure, or dodecahedrane (119: 85).
- The photochemistry spotlight shone on a technique that uses light to split hydrogen sulfide (H₂S)—an oil-refinery waste—into a potential fuel and a marketable element. 120: 147
- Compounds found in diesel exhaust were added to the list of known mutagens. 119: 26
- Researchers debated whether coffee drinking can be linked to pancreatic cancer. 119: 181; 120: 6. Other concerns on the carcinogen front included chlorinated drinking water (119: 54); the food additive cinnamyl anthranilate (119: 25); snuff (119: 213); combined exposure to 3,4-benzopyrene and low-level microwave radiation (119: 344); substances in parsnips (120: 156); and compounds found in broiled sardines (120: 39). Finally, studies indicated that in cases of brain tumors in children, the parents' occupa-

tional exposure to chemicals may be the culprit. 120: 22

- Benzoyl peroxide, a chemical used in acne medications, was found to be not a complete carcinogen, but rather a cancer promoter. 120: 283

- Two types of compounds were added to the suspect teratogen list; one inched closer to being removed from that list. Epidemiological evidence suggested that contraceptive foams, jellies and creams cause birth defects if used at or around the time of conception. 119: 229. A contaminated waste byproduct of synfuel production, or coal gasification and liquefaction, caused birth defects in crickets. 119: 213. And two separate studies suggested there is no significant link between the controversial anti-nausea drug Bendectin and birth deformities. 119: 406

- New studies failed to clarify the effects of ions, or charged particles, on living systems. 120: 364

- A polymer engineer and a surgeon joined forces to design an artificial skin for burn patients. The skin, which is constructed from cowhide collagen, shark cartilage and plastic, was used on 10 patients. 119: 4, 285

- A Pennsylvania researcher designed a battery sans metal (119: 101), and C&D Batteries and Allied Corp. later gained rights to that organic battery technology (120: 283).

- Scientists searching for a shark repellent first isolated pardaxin (119: 19)—the active ingredient secreted by the shark attack-immune Red Sea Moses sole—and then recognized that chemical's similarity to industrial surfactants (120: 39).

- Brandeis University chemists reported the first systematically, deliberately developed family of oscillating chemical systems, or solutions that swing between high and low concentrations of at least one of their components. 120: 188

- Computers invaded the laboratory. Chemists were searching for isomers, synthetic schemes and three-dimensional configurations on video screens. 119: 140

- In the realm of low-calorie sweeteners, aspartame was approved for market (120: 54); a patent was granted for a process that involves L-sugar, the left-handed counterpart to the normal right-handed sugar (119: 276); and Congress extended the moratorium on any saccharin ban (120: 39).

- National Bureau of Standards researchers proposed various materials tests for determining precisely what caused the July 17 collapse of two interior walkways in a Kansas City Hyatt Regency Hotel. 120: 196

- The U.S. Department of Energy decided to eventually convert Savannah River Plant defense high-level radioactive waste

into either borosilicate glass or SYNROC. 120: 396

- In a move that may open the door to a whole new world of silicon chemistry, Robert West and colleagues synthesized tetramethylsilane — the first-known silicon-silicon double bond-containing stable compound. 120: 389

Medicine

- Fetal medicine came of age with a handful of dramatic achievements — a life-threatening urethral blockage was corrected in one human fetus inside the womb and in another human fetus outside the womb; a human fetus with an inherited defect in biotin metabolism was successfully treated by giving large doses of biotin to its mother during pregnancy; a valve implanted in the skull prevented hydrocephalus in a human fetus and in monkey fetuses; genetically based cleft lip and palate were prevented in fetal mice by exposing their mother to high levels of oxygen during pregnancy, suggesting a comparable technique might be used to prevent genetically caused cleft lip and palate in human fetuses. 119: 326; 120: 70, 118, 181, 279, 363

- America's only test-tube baby clinic reported its first success in getting a lab-fertilized human egg to develop into a fetus in a woman's womb; test-tube twins were "midwived" in Australia. 119: 38, 311

- The drugs timolol and propranolol were found to prevent second heart attacks among cardiac patients, and the former was approved by the U.S. Food and Drug Administration for such use. 119: 230; 120: 292, 359

- A hepatitis B vaccine was approved by the U.S. Food and Drug Administration, constituting the first new viral vaccine okay by the FDA in a decade. 120: 327

- Vitamin and mineral supplements were found to significantly increase the intelligence of Down's syndrome children and some other retarded children — results that, if confirmed by other scientists, would be of considerable importance. 119: 85

- A successful therapy for spinal cord injury, which scientists had sought for many years, appeared to have been found. 120: 293

- The world's first workable artificial heart was ready for implant in a human patient. 119: 157

- For the first time, monoclonal antibodies made cancer regress in humans. 120: 117

- Genes from three kinds of human cancer cells were isolated, providing tools for learning more about the cancer process. 120: 199

- A relatively safe and often effective drug was found for gallstones, a condition that previously could be treated only by surgery. 119: 358

- Laetrile does not make cancer regress and does not extend the lifespan of cancer patients, a National Cancer Institute clinical trial of the substance found. 119: 293

- Mechanical engineering research suggested that low back pain is due not to bending but to the inability of intervertebral discs to act as shock absorbers and that arch supports, which reduce shocks to the back, could relieve back pain. 120: 325

- There was growing evidence that red blood cells assist white blood cells in their immune functions. 120: 262

- Young epileptics, it was found, could safely discontinue their anticonvulsant medication if they had been free of seizures for four years while taking it. 119: 309

Archaeology & Anthropology

- Four anthropologists reported that most changes in human evolution have been both gradual and cumulative. The researchers say they have, in effect, "confirmed Darwin's and Huxley's views on evolution." 120: 52

- A recently discovered series of mollusc fossils in Kenya suggests that a species remains unchanged for long periods and then abruptly transforms during times of environmental stress. 120: 292

- The discovery of 48 sharp flaked stone knives and three larger choppers pushed back the first human tool use to 2½ million years ago. 119: 83

- A Superior Court judge in California ruled that state education policies do not violate the rights of persons who believe in the biblical version of creation. The judge also ruled, however, that textbook publishers distribute a policy statement saying that Darwin's theory of evolution be treated as a conditional statement that includes some speculation. 119: 165

- Art thieves struck Mayan archaeological sites. 120: 37

- A Duke University anthropologist contended that contrary to prevailing thought Ramapithecus was a gentle, tree-dwelling animal that may not have come down from the trees until about six million years ago — seven million years later than many scientists have assumed. 120: 71

- The fossilized, 180-million-year-old jawbone of a previously unknown mammal was discovered in Arizona. 120: 198

- The bowerbird has been sought unsuccessfully for 90 years by bird enthusiasts and scientists. Now, UCLA ornithologist

and physiologist Jared Diamond said he has finally spotted one, in New Guinea. 120: 326

Earth Sciences

- Loihi, Hawaii's youngest seamount, made scientists re-evaluate ideas about the ways volcanoes form. Hints of primitive source material fuel debate. 120: 388
- A new arrangement of the ancient supercontinent Pangea may explain unsolved geologic problems. 119: 327
- Strings of volcanoes provide clues to locating submarine hot spots. 119: 356
- Peruvians, and scientists, reacted to a controversial (and unfulfilled) prediction of a major earthquake. 119: 100; 120: 5, 70
- Did an extraterrestrial body hit the earth 65 million years ago? Did it cause extinctions? Debate continued. 120: 36, 119, 314
- Preliminary findings showed the first evidence of decrease in stratospheric ozone. 120: 116
- Global warming of "unprecedented magnitude" was predicted. The cause? Combustion of fossil fuels and the ensuing CO₂ build-up. 120: 152
- With the combination of the Deep Sea Drilling Project and the Ocean Margin Drilling Program, the *Challenger* would retire and the *Explorer* would get a riser. 120: 165
- Submarine hot springs, rich in minerals, were discovered off the Oregon coast. 120: 215
- New seismic data portend shaky times for cities east of the Rockies. 120: 232



- Anomalous levels of radon, a possible earthquake precursor, arouse concern in California. 120: 247
- Industry partners pulled out of the Ocean Margin Drilling Program, casting doubt on the program's future. 120: 277

- The Antarctic ice cap shrank, possibly in response to CO₂-induced warming. 120: 311
- The Canadian research vessel *CSS Hudson* charted a safe route to the Northwest Passage through the pingo-infested Beaufort Sea. 120: 357

Technology

- The electronics revolution and related computerization of industry and business have ushered in a mushrooming escalation in the nation's vulnerability to electromagnetic-pulse (EMP) fallout from nuclear weapons. The Nuclear Regulatory Commission is concerned that EMP might even be able to induce reactor meltdowns. 119: 300, 314, 344, 359; 120: 307



Los Alamos Scientific Laboratory

- IBM scientists developed an integrated-circuit technology that couples the low power and size of transistor-transistor logic with switching speeds of emitter-coupled logic — the fastest circuit known. 119: 206
- A single 32-bit integrated-circuit chip can now pack 450,000 transistors and a 32-bit three-chip combination can pack the computational power once achieved only by large mainframe computers. 119: 135
- A mathematical equivalent to the toss of a coin eliminates practically all possibility of cheating a partner during telephone-linked computer transactions such as exchanging secrets or signing contracts. 120: 205
- Artificial intelligence progressed a step further with a backgammon computer program that captures "the essence of judgment" to deal with fuzzy, ill-defined situations. 119: 38
- The Public Cryptography Study group — an academic forum on computer-data encryption — voted to recommend a vol-

- untary system of prior restraint on the publication of cryptography research. 120: 252
- Bell Labs announced development of the first stable, efficient semiconductor photocathode cell to convert sunlight to electricity. 119: 135
- Computers are finally coming to grips with China's written language — both using it and printing it. 120: 26



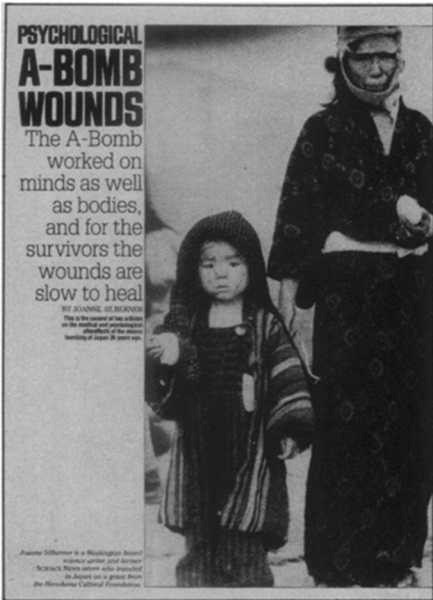
- A thermometer has been developed to measure rapid and regular temperature changes that signal both vibrational and electronic excitation of molecules. 119: 284
- Development of a maneuverable underwater vehicle made possible the preliminary photographic excavation of the northernmost shipwreck — a 125-foot sailing vessel sunk 128 years ago — now resting 330 feet below water and north of the Arctic Circle. 120: 179

Behavior

- A gene located near the human leukocyte antigen site on the sixth chromosome was linked to the susceptibility to depression in human beings. 120: 356
- Death of a spouse appears to be more devastating for men than for women. A Johns Hopkins study reported that widows live out a more normal lifespan than do widowers. 120: 85
- CT scans provided a valuable look at brain functions of autistic children. 119: 154
- Prenatal exposure to doses of gonadal hormones can masculinize or feminize the behavior of young rhesus monkeys. 119: 309
- The Surgeon General warned that even small doses of alcohol during pregnancy might harm the fetus and urged pregnant

women to drink absolutely no alcohol. 120: 53

- Psychological, as well as medical, aftereffects of World War II nuclear bomb blasts are still being felt by survivors. 120: 296



- Evidence suggests that emotional stress may indeed contribute to heart-related deaths. 120: 54

Science & Society

- President Reagan's call to cut "fat" from the federal budget ended in an eventual restructuring of research priorities based on excellence and pertinence. 119: 116, 131, 164; 120: 45, 59, 260, 276, 342
- The United Nations claims that the International Water Supply and Sanitation Decade, which it kicked off this year, offers "the possibility for achieving as great a change in the quality of human life as any program" it has ever launched. 119: 119
- The Supreme Court dealt the Reagan administration regulatory-reform strategists a sharp blow with its cotton-dust decision, which upheld the Occupational Safety and Health Administration's right to ignore cost-benefit analyses when setting pollutant-exposure standards for workers. 120: 15
- Debate began this year on amending the controversial Clean Air Act. 119: 151; 120: 102
- President Reagan named George Keyworth his science adviser. 119: 343
- Charging that Interior Secretary James Watt has undermined or circumvented basic environment-protection laws, environmentalists campaigned to force his ouster. 120: 55, 70
- The human-life (abortion) bill deals "with a question to which science can provide no answer," the National Academy of

Sciences declared in a resolution aimed at explaining its members' view toward congressional attempts at "scientifically" defining when life begins. 119: 293

- The spartan federal budget for research prompted creation of several organizations to defend science, technology and their share of the federal budget. 120: 46, 102, 276
- A National Academy of Sciences study suggested that whether a particular federal research-grant application is funded will be determined roughly half by luck. 120: 327
- The New York State workers' compensation board set a legal precedent as it handed down what is believed to be the first ruling to name "microwave illness" as a cause of death. 119: 166
- The Veterans Administration finally contracted a university research team to design a study to look for health effects in soldiers exposed to Agent Orange only to have the Office of Technology Assessment eventually declare that design flawed. 119: 325; 120: 377
- By unearthing documentary evidence implicating the Defense Department and its subcontractors with contamination of sites — including Love Canal — New York State may have thrown a monkey wrench into Justice Department suits asking Hooker Chemicals and others for the cost of cleaning up Love Canal. 119: 87
- Ralph Nader's Health Research Group identified 610 prescription drugs whose efficacy had not been established and asked FDA to withdraw them. 119: 92

Energy

- On July 17, President Ronald Reagan presented his "reformulated" energy-policy guidelines. Its philosophy and recommendations downplayed conservation and government involvement in energy development. 120: 68
- Plans to abolish both the Department of Energy and Education Department were announced by President Reagan in late September. 120: 212
- U. S. energy-consumption can be held at 1980 levels through the year 2000 without sacrificing economic growth or one's lifestyle, a study by the National Audubon Society found. And its major contentions were soon shored up by a controversial federal study. 119: 261, 276
- President Reagan announced policy initiatives his administration would undertake to aid the ailing nuclear industry. Most controversial was the lifting of a ban on the reprocessing of spent reactor fuel. 120: 228, 249
- Nuclear Regulatory Commission officials worry that faster-than-anticipated

embrittling of reactor pressure vessels is seriously threatening the safety of older pressurized water reactors. 119: 390

- The Canadian discovery of a yeast with a healthy appetite for five-carbon sugars may spell an eventual breakthrough in ethanol and gasohol economics. 120: 100
- A demineralizer has begun decontamination of the 2.5 million liters of radioactive water generated by the Three Mile Island accident. 120: 247
- Radon levels found in many energy-efficient homes provide radiation exposures equivalent to those that have produced lung cancer in miners. 120: 301
- A National Research Council review of the solar-power satellite concept concluded that no money should be spent on its development for at least a decade due to outrageously escalating cost projections. 120: 20
- Natural bacterial partnerships have been found that convert carbon dioxide into the components of crude oil. 119: 40
- Field tests began in Mali on the usefulness of a low-cost Fresnel-spiral solar cooker. 119: 203
- Solar-powered liquid-metal magneto-hydrodynamics cogenerates heat and electricity with an efficiency surpassing steam turbines. 120: 109
- A solar-pumped laser is being harnessed to beam power from satellite heights and to launch or propel space vehicles. 119: 381



Environment

- A large government report, *Global Future*, recommends steps the United States should take to help prevent an irreversible impoverishment and degradation of world resources. 119: 53
- Gamma radiation and even diagnostic

X-rays may be more biologically destructive than previously thought, according to several new recalculations of Hiroshima-bomb radiation fields. 119: 343

• A U. S. Army pathologist reported signs of a possible link between chronic exposure to microwaves and a rare blood disease. Meanwhile, a Polish researcher found that combined exposure to 3,4-benzopyrene and low-level microwaves accelerates development of both spontaneous and clinically induced cancers in mice. 119: 270, 344

• A bacteriologist has been successful in creating bacterial strains that degrade such problem chemicals as 2,4,5-T (found in Agent Orange) and certain chlorinated biphenyls. 119: 246

• The Interior Department issued the first leases allowing energy companies to explore for oil and natural gas in wilderness areas—an unprecedented and controversial move. 120: 327

• A Japanese study found that passive smoking — involuntary exposure to cigarette smoke — appears to increase one's risk of lung cancer. But American Cancer Society research later identified flaws in that study. 119: 53; 120: 6

• People who drink coffee may be at double or triple the risk of developing pancreatic cancer. 119: 181; 120: 6

• California and the nation worried over efforts by the state to eradicate the Mediterranean fruit fly. 120: 35

• Though video display terminals received a clean bill of health from the Food and Drug Administration, puzzling health effects continued to be linked with certain users. 119: 344; 120: 137, 150, 377

• Gas ranges may impair the lung function of those who live in homes using them. 120: 262

• Burning fuel oil for space heating probably contributes half of the mutagenic activity per cubic meter of air in New York City. 119: 26

• A study using monkeys found that noise can trigger high blood pressure, a major cause of strokes and heart attacks. 119: 198

The tiny medfly threatened the \$4 billion California fruit and vegetable crop and the political future of an ambitious governor.



USDA

Physics

• First storage-ring collisions of protons and antiprotons were achieved at CERN in Geneva 119: 246; then the energy was increased by a factor of ten to 270 billion electron-volts. 120: 212

• An experiment in India yielded suggestions that protons may be subject to radioactive decay. 119: 388

• More evidence for bodies with fractional electric charge was reported from a long-running experiment directed by William Fairbank of Stanford University 119: 68; and a hint of fractionally charged bodies came from a different kind of experiment at CERN. 120: 311

• Construction of the Large Electron-Positron collider (LEP), a machine to collide 50 billion electron-volt electrons with positrons of the same energy, was authorized by the CERN council. 120: 343

• Optical parametric oscillation, which may lead to parametric amplification and frequency mixing of optical fiber signals analogous to the parametric amplification of radio signals, was demonstrated in an optical waveguide. 119: 296

• Evidence was found that quarks, which are believed to be produced in electron-positron collisions and then immediately to decay into streams of other particles, possess electric charge as theory expects. Work was done at the DESY laboratory in Hamburg. 119: 132

• Synchrotron radiation was used to study the photochemistry of photosynthesis. Results suggest that manganese ions play a catalytic role. 119: 197

• A method for making a mirror that will reflect X-rays that hit it perpendicular to its surface was demonstrated (older methods of X-ray reflection worked only at grazing incidence). 119: 84

• A new experimental failure to find hidden variables, the objects that are supposed to make the probabilistic processes of quantum mechanics deterministic, indicates they are probably better hidden than ever before. 120: 117