

## GENERAL SCIENCE

# 1961 Science Review

Detailed highlights of achievements of the year as reported and compiled by Science Service as a record of an eventful period of science, research and technology.

*This summary is limited to highlights, and credit to investigators and institutions is necessarily omitted. If you want more information about any item in the summary, send 25¢ to help cover answering costs for each item upon which more information is requested. Address Science Service, 1719 N St., N.W., Washington 6, D. C.*

## ANTHROPOLOGY AND ARCHAEOLOGY

## Manlike Creature Lived 1,750,000 Years Ago

Atomic dating by the potassium-argon method of the rock bed in which *Zinjanthropus boisei* was found indicated that this ancient manlike creature lived about 1,750,000 years ago.

Finding of bones of a foot and a hand belonging to a very early manlike creature in East Africa threw new light on man's ancestry and evolution.

Study of remains of Neanderthals at Krapina in Yugoslavia showed that these specimens were between "classical" Neanderthal and a type more like modern man in evolutionary development.

Evidence was found in Iran that man was living in the developmental stage between dependence on hunting and gathering and dependence on agriculture some time between 15,000 and 8,000 years ago.

Objects found in Shanidar Cave in Iraq included flints made by Neanderthals who lived there as long as 100,000 years ago, tools showing how man progressed from hunting and gathering to domestication of animals and plants about 10,500 years ago, and also bitumen, evidence of trade with people at least 150 miles away.

Remains of a pre-Sumerian culture in Turkey were found to include mud-brick houses and plastered floors dating back to seven thousand years B.C., indicating that this Neolithic culture extended over larger areas than believed previously.

A more accurate determination of the half-life of carbon-14 (5,760 years) resulted in a re-dating of the Dead Sea Scrolls at 20 B.C. instead of 40 A.D.

The relationship between man and other primates was indicated by a study of the similarities and differences of chromosomes and their linkages.

A new scale for dating archaeological finds was developed, using the direction of alignment of magnetic particles in clay and depending on the fact that the earth's magnetic field has shifted in direction during past centuries.

Factors affecting the relation of the condition of patina to its age were determined, making it possible to determine the age of archaeological specimens from the patination.

Study of 1,200 skeletons of ancient people of Hawaii indicated their body build was very much like that of modern Hawaiians and modern Americans; the average age of adults at death was about 31 years, and the greatest mortality occurred between years one and three.

Radiocarbon dating showed that migrations into the Pacific Islands occurred centuries earlier than has been believed.

Discovery of hundreds (about 800) of beautifully made prehispanic paintings of Pueblo Indians at the site of Pottery Mound, New Mexico, gave information on ceremonial and artistic background never before known.

## ASTRONOMY

## Reflected Radio Signals Give Distance to the Sun

Radio signals reflected from Venus back to earth showed that the distance from earth to sun is 92,960,800 miles, plus or minus 1,000 miles, and that the planet's rotation time is 225 earth days, the same as its year.

From a study of blinking, Cepheid variable stars new evidence was found that the Milky Way galaxy is a huge spiral with three arms, the sun appearing to be in the middle one.

Study of the remains of satellite Discoverer XVII, after exposure to a severe solar storm, suggested that tritium, a rare form of hydrogen used in making hydrogen bombs, is produced by the sun during a solar flare.

The mass of the nearest star cluster, the Hyades, was calculated to be about 500 times that of the sun on the basis of a new theory of fragmentation.

An individual star was found that emits radio signals ten million times stronger than those of the sun.

The two natural cloud-like satellites that travel around the earth at the same distance as the moon and look like faintly luminous patches were reported photographed for the first time.

By seeding the atmosphere of Venus with algae to split the carbon dioxide into oxygen and carbon, man could be landed and survive on that planet, it was suggested.

From simulated atmospheric studies showing that simple organic molecules may be produced in an atmosphere like that of Jupiter, it was reported that life may be possible on that planet.

Although the rotation rate of the famous red spot on Jupiter is not uniform with that of the planet, its latitude remains the same, it was reported, because it is the top of a fluid column of atmosphere.

Tiny meteoritic material found in tektites strongly indicated that this glassy material of uncertain origin comes from outer space.

"Nanometeorites," one-thousandth the size of micrometeorites, were detected entering the earth's atmosphere in samples of air collected by a U-2 research plane 60,000 feet above the Arctic.

Observations made by radio telescope during a lunar eclipse indicated a three-layer structure of the lunar surface consisting of an outer layer of sandy material, a second layer that is a good conductor of electricity and the third, a rocky material.

A contour lunar map, showing the location of high and low areas, was prepared to aid the first men to land on the moon, from photographs taken with a 36-inch refractor.

An electron shell about 45 feet thick at the surface of the moon, created by ultraviolet rays

of the sun, repels and transports the positively charged dust particles that finally settle to cover the lunar craters, it was reported.

Observations suggest there is a frozen layer of water nearly one-half mile thick probably 100 feet beneath the surface of the moon.

A purely descriptive international system of naming the moon's surface features was proposed by one German and two U.S. scientists.

An artificial moon which transmits radio signals was used by Russian scientists to determine by comparison the true intensity of the moon's thermal radiation.

Filaments crossing sunspots were reported to be a clue to giant solar flares which emit cosmic rays.

## BIOLOGICAL SCIENCES

## Life From Outer Space Rides in on Meteorite?

Bacteria-like cells found inside stony meteorites were successfully grown and reproduced in the laboratory, indicating the possible existence of life in outer space.

A birth control chemical, triethylenemelamine, previously rejected for human use, was found successful in the control of bird pests.

Imported beetles, insect enemies of weeds, reportedly cleared more than a half million weed-infested acres in California and the Northwest.

A type of barley that is adaptable to any of the world's grain growing areas through very rapid evolution was distributed throughout the world by the United Nations' Food and Agriculture Organization.

A chemical solution that keeps sperm cells alive for long periods without refrigeration was developed, making artificial insemination of livestock practical in undeveloped countries lacking refrigeration.

Work was begun on an international plant index that, when completed, will list the world's 1,700,000 Latin plant names in a 50-volume master reference work.

The replacement of Latin names by numbers was predicted as electronic computers come into use to sort members of the animal and plant kingdom.

Sugar mixed in the soil was found to be one of the most effective killers of the nematode or round worm.

Adenine, a compound basic to life, was isolated from a mixture of hydrogen cyanide, ammonia and water, components of comets and probably of the earth's primeval atmosphere.

The radiated bacterial spores that developed a high degree of resistance after heavy radiation in Discoverer satellites XVII and XVIII were adopted as the "biological index" to measure the radiation hazard on living matter in space.

Anthogens, blossom-stimulating hormones extracted from various plants, were successfully used to induce earlier blooming in 70 varieties of plants.

The first case of chicken malaria was recorded in the United States.

An international committee was formed by European and American scientists for coordinating research on the harmful effects of pesticides on wildlife.

Pregnant ewes were rendered unpregnant by a tiny infectious organism, *Toxoplasma gondii*, that caused the mother's body to reabsorb the fetus.

A chemical in the saliva of the queen bee was found responsible for her attractiveness to the workers.

A complex enzyme, keratinase, removed natural hair from hides without damaging the hide, producing a better quality leather.

Rice production in West Africa can be increased by millions of acres by developing mangrove swamps, studies indicated.

Studies with the electron microscope showed that every living cell has an outer coating of complex sugar compounds over an inner coating of plasma membrane.

Tissue culture was obtained from plant pollen, providing valuable information on tissue formation and growth.

By isolating the photosynthetic process from the complex living cell, scientists found that photosynthesis is independent of the presence of oxygen and more closely linked with absorbing phosphorus.

Photosynthesis depends on two primary photochemical reactions rather than the previously believed one, it was reported.

The most effective repellent for sharks was found to be a nigrosine dye that makes water around the swimmer black and opaque.

The cave crayfish that lives deep underground was found to have a daily metabolic rhythm like that of creatures living on the surface.

A tiny radio transmitter was attached to the back of a homing pigeon to track the bird during flight.

Human beings may infect animal pets with TB, it was found.

An International Biological Project, organized along the lines of the International Geophysical Year, was proposed to study world problems such as population control and food supply.

Surveys showed that cancer exists among the fish in every trout hatchery in the United States, but the growths are not very malignant and cannot be contracted by eating the diseased trout.

A simple method was developed for drying cells for microscopic study, using phosphorus pentoxide, permitting indefinite storage of the dried cells without damage.

Immature male mosquitoes, exposed to excess heat, developed into females.

A 30-mile long artificial reef of old boats was effective in luring fish to barren stretches of coastal waters.

Breeding, not feeding, is the biggest factor in the tenderness of meat, it was found.

A powerful attractant of termites was isolated from rotting wood and has possibilities in controlling these destructive insects.

Rous sarcoma virus, which ordinarily affects only birds, was found also pathogenic to mammals, causing a hemorrhagic disease in rats and tumors in rabbits, a Russian scientist reported.

A mosquito, *Anopheles hackeri*, that transmits malaria to monkeys in nature, was identified and reported.

A natural hybrid tree, a cross between big-tooth aspen and silver poplar, was reported to have grown 70 feet in height and 13.7 inches in diameter in 17 years.

A new oyster disease, called "curdle disease" because of its effect on oyster tissue, was discovered on the Eastern Shore of Virginia.

Light can kill eggs and developing embryos of salmon and trout in a few minutes and is probably just as lethal to the young of all other water-dwelling animals, scientists reported.

A dose of X-rays as low as five roentgens increased the mutations and reduced the offspring of fruit flies.

Plankton samples were collected by a submarine under the polar ice to determine where marine life of the North Atlantic begins to mingle with that of the North Pacific.

Insects and mites were found 6,000 feet above sea level in the Mt. Gran area, probably the highest known altitude for insect life in Antarctica.

A moth found in England with radioactive dust from an atomic bomb test in the Sahara strengthened the theory that some moths in England winter in Africa.

A tiny thermometer that measures temperature changes in millionths of a degree was used to study the chemistry of nerves and muscles.

Chemical methods that measure inherited and

distinctive protein structures were used to trace family relationships of birds.

"Snorter" dwarfism, a major problem among cattle breeders, was found to be an inherited disorder of metabolism.

Soil scientists found that sorghum-stubble traps held snow on the fields, preventing drifts along fence rows and in ditches.

The attractant that occurs naturally in the female gypsy moth was identified and synthesized.

Chickens resistant to erythroblastosis, an infectious leukemia-like cancer of the bone marrow and blood, were developed, indicating that animals can be bred to resist at least one form of cancer.

The fungus *Catenaria vermicola* was found to kill root-knot and other types of nematodes.

Experiments showed that radioactive fallout cannot be removed effectively from farm land by the harvesting of crops.

Dried spores of *Bacillus thuringiensis* applied to the tips of tobacco plants were successfully used to control the tobacco budworm.

Substantial savings of time and labor in pinpointing dairy herds affected with brucellosis were made by taking the milk samples used to test for the disease from milk used in butterfat tests.

#### CHEMISTRY AND PHYSICS

### Element 103, Lawrencium, Is Latest Discovery

Discovery was announced of a new chemical element, No. 103, with a half-life of about eight seconds and the name lawrencium was given to it in honor of the late Dr. Ernest O. Lawrence, founder of the laboratory in which the discovery was made.

A new amino acid, the first with a basic all new structure to be found in more than 25 years, was found in the collagen of the Achilles tendon in cattle.

Luciferin, the compound that makes fireflies light up, was synthesized in the laboratory.

A detergent-like chemical, a sulfonic acid derivative called a sulfosugar, was found in the portion of the green plant leaf that contains chlorophyll and may hold the key to how sulfur is used in photosynthesis.

The theory was advanced that an anesthetic acts through the formation of submicroscopic crystals that interfere with the electrical activities of the brain.

A new, more accurate method was developed for measuring tritium, the triple-weight, radioactive isotope of hydrogen, with a gaseous hydrocarbon, ethane.

A method was developed for growing artificial crystals clear and free of strain and with high concentrations of paramagnetic ions.

A method was developed for producing extremely high temperatures by pumping electrical voltage into a burning gas flame, producing temperatures of about 4,000 degrees to 9,000 degrees Fahrenheit.

A new standard for the weight of the chemical elements was adopted by international unions of both chemistry and physics, replacing oxygen standards with carbon-12.

A study was made aimed at developing an unambiguous notation system for naming chemical compounds that could be used in modern automated equipment.

Isoprene for the production of synthetic natural rubber was produced by combining two molecules of propylene, a by-product of petroleum cracking, to form a six-carbon atom molecule called methylpentene and then knocking off one carbon atom.

A system of logic was devised by which an electronic computer can be used to design the

most efficient manufacturing plant to produce any chemical.

Synthesis of amino sugars assured scientists sufficient quantities to lead to an understanding of important life processes.

A separation technique, using gas chromatography, was developed to analyze sex hormones in minute amounts.

The sequence of amino acids in tobacco mosaic virus, one of the few proteins so characterized to date, was determined.

An ACTH molecule with all the biological activity of natural ACTH, containing 23 amino acids, was synthesized.

Adenine, an amino acid basic to life on earth, was produced from hydrogen cyanide, ammonia and water, chemicals believed to have been present on earth in its early stages.

An electron probe micro-analyzer, an instrument that makes it possible to detect as little as one-quadrillionth of an ounce of a chemical element in a mixture, was successfully operated.

An elementary particle, the omega meson, was discovered and found to have 1,540 electron masses and no electrical charge.

A new standard of accuracy for broadcasting time signals and constant frequency was achieved using the oscillation produced by the cesium atom as the basis of an atomic clock having an accuracy of one in ten billion.

A method was developed for direct visual observation of the interior of solid materials by passing X-rays through a solid crystal onto a photosensitive surface from which an identical pattern of electrons is released to strike an amplifying surface.

Chlorinated plastics were converted into semiconductors when irradiated with ultraviolet light.

A thin film of a normal metal not naturally a superconductor was made to act like one when in contact with a superconducting metal film at a specific, very low temperature near absolute zero.

An optical maser was made from uranium.

A "Black Void Reactor," an atomic reactor for research, was developed, making possible the simultaneous presence of fast and slow neutron fluxes separated in space.

Safe use of strontium-90 and cesium-137 in radioisotopic electric power sources was made possible by development of insoluble ceramic strontium titanate and cesium polyglass.

Radiation for studying the structure of matter was produced with a pair of optical masers by heating one of the masers, thus allowing the frequency to be tuned over the entire range of the infrared spectrum.

Soft electron radiation was found to emanate from such ordinary substances as zinc powder and aluminum filings.

A system, called AUDIT, was developed for monitoring underground nuclear explosions, using small, transportable, monitoring stations that could operate unattended for long periods, reporting to distant receiving stations.

The first pure compounds of the man-made element californium, No. 98, were prepared, and identifiable chemical reactions were carried out with such minute quantities as one ten-millionth of a gram.

The quantity of available water in arid regions was estimated by determining the age of the water by radiocarbon dating.

Practical uses were found in high-speed computers, photography and energy storage for a nuisance phenomenon, "persistent internal polarization," which occurs when luminescent materials are exposed to radiation.

A proton beam of more than 30 billion electron volts was attained at Brookhaven National Laboratory, higher energy than ever before achieved by man-made machines.

A novel radio receiver, containing no tubes, no transistors and no traditional electronic circuits but only six small silicon wafers, was

developed to illustrate the principle of molecular electronics.

The triple point of water, 273.16 degrees Kelvin or 0.01 degree centigrade, replaced the ice point, 0.00 degree centigrade, as the fundamental fixed point on the absolute temperature scale.

A simply constructed device, the tunneltron, was developed for use in low-temperature instruments, widely extending their applicability.

Liquids were mixed automatically in equipment containing no moving parts by placing the liquids in glass containers between two electrodes where they are mutually attracted by the opposite charges from the electrodes with which they are in contact.

Trapping of radioactive wastes in solidified molten glass was found to be an effective and inexpensive method of disposal.

Resumption by the Russians of nuclear testing in the atmosphere was reported to threaten the world with a large amount of radioactive fallout.

With a niobium-tin wire it was found possible to make very powerful magnets which may be applicable to controlled nuclear fusion and atom smashers.

A superconducting magnet weighing only a pound and about the size of a doughnut produced a magnetic field of 43,000 gauss and was expected to help harness the fusion reactions for peaceful purposes.

Evidence that the physical world is "multiple-connected" was found in the prediction of the existence of electricity in nature based only on Maxwell's equations of electromagnetic waves and Einstein's general relativity theory.

Underground testing of nuclear devices in the U. S. was resumed on Sept. 15.

The 1961 Nobel Prize in Physics was awarded jointly to Dr. Robert Hofstadter of Stanford University for his work on the structure of the nucleus and to Dr. Rudolf L. Mossbauer of California Institute of Technology for his discovery that, under certain conditions, nuclei could emit or absorb gamma rays without any recoil.

The Nobel Prize in Chemistry was awarded to Dr. Melvin Calvin of the University of California, Berkeley, for his contributions toward unraveling the secret of how the green leaf uses the energy of the sun in the photosynthetic process.

The 1961 Atoms for Peace Award was given to Nobelist Sir John Cockcroft, who led development of full-scale nuclear-powered generating stations supplying electricity to England.

#### ENGINEERING AND TECHNOLOGY

### Process Removes 98% Strontium-90 From Milk

A process that removes 98% of the strontium-90 from milk was devised to reduce strontium-90 content of milk in a post-attack situation.

A relatively inexpensive freezing method was devised to convert salt water into fresh, using butane gas both as the refrigerant and the melting agent.

An "organic" fuel cell was developed that uses sea water and ocean bottom sediments to produce electric energy directly from decomposing organic matter.

A computer was designed completely from information supplied by another computer.

An electronic computer was designed to talk and sing when instructed by punched cards.

A computer designed especially for automatic programming was constructed.

A new process using the vapor reheat principle for the conversion of salt water to fresh was reported.

A computer was produced to solve problems

as a child does, by associating perceptual symbols with appropriate motor symbols.

An electronic device was developed for use in the orbiting astronomical observatory program which will give man a view of the universe as it looks in ultraviolet light.

A new acrylic latex paint was developed to be used inside nuclear submarines that remain underwater for prolonged periods, replacing the conventional paints which release poisonous substances long after application.

A jet plane to check navigational aids at high altitudes was equipped with a fast and accurate electronic computer system so that its position in the air is known within 400 feet at all times.

A flying automobile was built that can be changed from an airplane to an automobile or vice versa in five to ten minutes.

Preliminary experiments to prevent mining disasters by probing through coal mine roofs with sound waves to seek hidden weaknesses that might cause cave-ins proved highly successful.

A tiny new thermoelectric device was developed that can boil or freeze a drop of water using the power from two flashlight batteries.

The first distribution transformer that does not use oil in significant quantities for cooling and insulating, was designed.

Large diamonds more than a carat in size were produced synthetically for the first time.

An instrument was devised to detect weaknesses caused by corrosion in oil well walls.

The value of "pi" to 100,000 digits was computed in eight hours by an electronic computer.

A sun-powered generator that converts solar energy directly into electricity to operate a motor-driven water pump was developed, with possibilities for use in underdeveloped countries.

A chemical process was developed that permits mass production of niobium-tin, a superconductor material used in magnets for nuclear research machines and ultrasensitive receivers.

Lignin, a waste by-product of paper manufacture, was used satisfactorily in automobile tires, replacing 10% to 40% of the crude rubber content.

#### GEOPHYSICS

### Third Radiation Belt Discovered Around Earth

Another radiation belt in addition to the two Van Allen belts was discovered about 34,000 miles away from the earth.

The earth's equator was found to be slightly egg-shaped, rather than circular.

An International Year of the Quiet Sun was announced for 1964-65, a time when sunspot activity is low, to complement the IGY program, emphasizing upper atmosphere and space studies sensitive to changes in solar activity.

A pair of radiation polar caps "hang" about 20,000 miles above the North and South Poles, it was suggested.

The deepest hole ever drilled in the ocean floor, 12,300 feet below the ocean surface, was achieved during preliminary drilling for Project Mohole, an attempt to eventually reach the earth's mantle underlying the crust.

Preliminary drilling off the Mexican coast during Project Mohole yielded core samples showing that soft sediments resting on the ocean floors are much shallower than once believed and that sea life was abundant in the area 25,000,000 years ago.

The southern block of the San Andreas fault including Baja California was found to have moved 300 miles northwest since Cretaceous time, separating the southern tip of Baja California from the Mexico mainland at the Jalisco bulge.

A world-wide layer of "haze" containing mostly ammonium sulfate crystals with some

silicon and iron was discovered about 11 miles above the earth's surface.

The first thorough and accurate survey of the ocean waters between Hawaii and Alaska was started along a 1,900-mile line.

The brightness of the extremely faint luminous gas crown of hydrogen that surrounds the earth at altitudes above 60 miles decreases quite rapidly with altitude, it was reported.

An earthquake was recorded for the first time by an instrument placed on the deep ocean floor.

A new, more accurate geological time scale covering at least 600,000,000 years was made from improved dating methods, such as the rubidium and potassium "atomic clocks."

The five Great Lakes were carved out of rock by ancient rivers and not by glaciers, it was reported.

To measure the ocean currents, automatic buoys were strung along a line stretching 670 miles from New England to Bermuda.

A strong current was found in the Atlantic Ocean flowing eastward along the equator in the opposite direction to the weaker surface currents, a counterpart to the one in the Pacific Ocean.

Coesite, a mineral usually created when a huge meteorite crashes into the earth, was found also in the depths of an atomic bomb crater and in a man-made diamond.

A new method was developed for finding ore deposits by detecting trace amounts of molybdenum in nearby streams.

A huge scar in the Pacific Ocean floor moved 720 miles in 100,000,000 years, magnetic surveys from ships showed.

A new core drill was developed that can melt its way through 12,000 feet of glacial ice.

A new international cooperative program known as the Upper Mantle Project was planned to study the earth's crust down to several thousand feet below the surface all over the world.

Five new minerals, compounds of lead, zinc, manganese, manganese-zinc, and iron, were discovered in a single locality in the Sierra Madre Mountains in Mexico.

First sounding by radio waves of the top side of the ionosphere from a rocket was made.

Invisible red arcs in the sky (airglow) were detected at middle latitudes and the equator.

The 1961 hurricane season, one of the most intense in recent years, closed with a toll of more than 400 deaths and an estimated \$400 million worth of property destroyed.

Hurricane Hattie slammed into British Honduras with sustained winds of 150 miles an hour and gusts up to 200 miles an hour, resulting in the greatest natural disaster in that country's history.

Newly established weather radar stations at Galveston, Texas, and Lake Charles, La., were credited with saving many lives in the savage attack on the Texas coast of Hurricane Carla, which had much wider coverage with research aircraft than any previous storm, permitting analysis of the storm's life cycle and insight into origin of such storms.

The network of radar warning sentinels scanning the coastal waters from southern Texas to Maine was completed.

The period of uncertainty as to when or whether a hurricane may curve toward land might be reduced considerably by spotting a characteristic change in the hurricane's eye, it was suggested.

A robot station, Nomad I, was placed in the Gulf of Mexico to send coded weather information back to shore.

An automatic weather station powered by a strontium-90 thermoelectric generator was installed on Axel Heiberg Island in the Canadian Arctic.

Cloud photographs from Tiros III gave the first indication of the existence of Hurricane Esther.

As result of cloud seeding of Hurricane Esther, large numbers of water droplets which existed in the subfreezing layers of the hurricane clouds were converted to ice crystals after being treated with silver iodide, but previous statements regarding the triggering of sudden changes in the path of a hurricane by seeding were not confirmed in this storm.

The largest research program ever attempted to study tornadoes, squall lines and severe local storms was undertaken.

A national operational meteorological satellite system, to be developed in three phases extending beyond 1965, was approved.

Smog studies were aided by development of a radioisotopic smog analyzer in which the release of krypton-85 from cage-like clathrate compounds is measured.

Worldwide communications were disrupted and spectacular auroral displays were produced by one of the severest storms on the sun in recent years, even though the solar activity was past its peak.

AMOS IV, an automatic weather station equipped with a specialized digital computer, was in the final stages of development.

An electronic device that draws weather maps from data supplied by tape, permitting weather analysis to proceed much more rapidly than heretofore, was in operation.

The World Magnetic Survey, an international program to map comprehensively the earth's magnetic field, was undertaken.

#### MEDICAL SCIENCES

### Measles Vaccines Soon Ready for Licensing

The drug methotrexate cured one type of cancer, choriocarcinoma, which occurs in the placental tissues during the process of child-bearing.

Recommendations for production of new measles virus vaccines were tentatively drafted following an international conference on measles immunization at the National Institutes of Health.

Hepatitis virus was cultivated successfully in a laboratory, which points eventually to a vaccine against infectious hepatitis, a debilitating disease that has been on the increase for the past four years.

Children with eye cancer that has spread to other parts of the body have lived longer than expected through treatment with a combination of three drugs, Cytosin, actinomycin D and methotrexate.

For the first time evidence was found that a chemical agent called 5-fluorouracil has some effect in bringing about reduction or disappearance of cancer of the large bowel.

A new anesthetic, methoxyflurane, was reported superior to the commonly used diethyl ether because it is nonexplosive.

New hope for barren women was reported through using a new experimental drug called MRL/41, which brought about menstruation in 28 (75%) of women treated for abnormal absence of the monthly cycle. Four became pregnant.

Bretylum was used to prevent the effects of drugs from gradually diminishing.

A Russian-made mechanical stapler to close surgical wounds without sutures was demonstrated in the U.S.

Prevention of tuberculosis in 80% of 12,000 known household contacts of persons with the disease was reported through use of isoniazid, which has been used previously in treatment of TB.

Radiosurgery of the brain without opening the skull through use of proton beams was reported.

The Sabin live oral poliovirus vaccine, types

one and two, was licensed for production in England.

Purivax, a new purified and concentrated killed poliovirus vaccine, was 98% effective in patients inoculated.

Ultrasonic waves, inaudible to the human ear, were used successfully in treating the chronic ear ailment, Meniere's disease, without damage to hearing.

A new steroid drug, called Celestone, was reported to have fewer side effects than other corticosteroids in treating asthma and eye difficulties caused by allergy.

Whether a woman should have X-ray treatment or surgery in the early stages of cancer of the cervix (neck of the uterus) was shown by tests on tissue sections and tissue smears made from biopsies.

Storing human sperm in underground banks for future needs in the nuclear age was advised.

Good results using synthetic skin to treat severely burned children indicated mass burn casualties in the future may be treated temporarily with the substitute skin.

Radioactive iodine was used to treat patients with irregular heart rhythms and the severe heart pains of angina pectoris.

Treatment of acne was successful in 83% of 30 patients treated with the antibiotic Declomycin, a trade name for demethylchlortetracycline.

An expectant mother for the first time survived an operation in which a heart-lung machine handled the patient's total blood circulation.

X-ray damage to normal tissues was lessened in treating human cancer by placing patients in an atmosphere of increased oxygen pressure.

Blood clots of the kind that frequently lead to heart attacks in humans were produced in experimental animals, thus giving a needed tool for testing treatments designed to prevent heart disease.

Guanethidine was reported successful in prolonged treatment of high blood pressure.

Lung cancer cells were grown in test tubes, enabling scientists for the first time to study the specific chemical and physical behavior of human lung cancer under controlled conditions.

Fire ant venom checked the growth of 15 fungus organisms, most of which infect humans.

A new general anesthetic called G-29, made in Switzerland, which is effective in 15 seconds by intravenous injection, was reported in use in the U. S.

A new machine, called a cardiactivator, revived a 67-year-old man five times after his heart stopped beating within a two-hour period.

The only known surgical operation for sporotrichosis, an uncommon fungus-type lung disease, was reported.

A new type of liquid electrode was developed for eye surgery, especially retinal detachment and certain types of glaucoma.

Radioactive isotopes were used to diagnose a serious complication of the birth process known as placenta previa in time to save the lives of mothers and babies.

Prevention of premature births was achieved in 43% of 156 pregnant women who were given a muscle-relaxing drug called isoxsuprine.

A new drug called CAPLA (mebutamate) was reported to reduce high blood pressure without side effects.

Balloon pictures taken inside the stomach revealed whether or not a patient had cancer.

Phenylramidol, a new drug, was reported to act like codeine in relieving pain and also to have muscle-relaxing properties when used to treat arthritis of the spine, back sprains and bursitis.

Successful brain surgery for epileptics whose seizures could not be controlled with pills and other medication was reported.

A single feeding of certain polynuclear hydrocarbons produced breast cancer in healthy female rats, raising the question of human consumption of harmful hydrocarbons.

Bone marrow was regenerated in 13 of 17 children with usually fatal aplastic anemia, by use of testosterone, the male hormone, in combination with corticosteroids.

Thyroid cancer was reported on the increase among young children as a result, apparently, of radiation treatments for other ailments around the head and neck.

Cancer cells disappeared rapidly from the blood stream of laboratory animals after they were injected with heparin, a substance that prevents blood clotting.

Nontropical sprue, a digestive disorder that is probably inherited, was alleviated in 27 of 29 patients by a gluten-free diet.

The speed and volume of blood flow was measured electromagnetically without opening a blood vessel.

A direct suction tracheotomy tube was designed by a nurse to enable surgeons to work faster on patients who must breathe by tracheotomy.

Abnormal chromosomes were found in a brother and sister with cerebral palsy and congenital cataract.

A new test for detecting rheumatoid arthritis before clinical symptoms appear was found, using polysaccharide dextran to extract from the red blood cells a sticky protein substance, believed to be the "rheumatoid factor."

A vacuum-extractor to replace forceps in abnormal childbirth was approved for production in Russia.

Approximately 90% of hayfever patients given alum precipitated pyridine-ragweed complex, or allpyral for short, showed good results, as compared with 80% to 85% of patients who improved when given standard aqueous solutions.

X-rays were used to tell tales on parents who willfully injured their young children but tried to cover up the real reason for the injuries.

A new drug, named oxyphenbutazone, was reported effective on patients with rheumatoid arthritis, fibrositis and bursitis.

An instrument called the RKG 100, based on a radio-electrocardiograph system originally used for astronauts, was successfully used to give stress tests to reveal heart conditions.

A link between inherited factors and chronic arthritis was found in women surveyed in England.

Radioactivity concentrations in drinking water were limited by the U. S. Public Health Service for the first time.

The 1961 Nobel Prize in Medicine went to Dr. Georg von Bekesy for his studies on the physical mechanism of stimulation of the cochlea by sound.

Precise brain surgery destroyed the area causing shaking palsy (Parkinson's disease), the jerks of epilepsy, neuralgia and other conditions that did not respond to medication.

The lives of many paraplegics are expected to be saved through use of a new drug, Renacidin, which dissolves the kidney and bladder stones that form in almost every patient with paralysis of the legs and lower part of the body.

A simple blood test before babies leave the hospital was reported showing whether or not the infants have phenylketonuria (PKU), a metabolic disease, which if untreated before one month of age, can lead to mental retardation.

Ten dogs whose stomachs were removed and replaced survived from three months to two years in spite of cutting nervous system connections.

## PATENTS

**U.S. Patents Number More Than 3,000,000**

Numbers following items are U.S. patent numbers. Printed copies of patents can be obtained from the U.S. Patent Office at 25 cents each. Order by number, do not send stamps, and address orders to the Commissioner of Patents, Washington 25, D. C.

Notable and interesting inventions patented during the 125th anniversary year of the patent system include:

A method of identifying and selecting checks by electronic numbers. Patent No. 3,000,000.

An improved method for controlled "growing" of individual diamonds, using a new type reaction chamber. Patent 2,992,900.

An irradiation process to change the color of diamonds from the less popular yellow and brown into the more valuable colorless and bluish. Patent 2,998,365.

A device that automatically places the automatic transmission of a car into the "park" or "neutral" position upon application of the emergency brake. Patent 2,970,679.

A rotating plasma device that could be used to control the fiery energy of fusion reactions once scientists have achieved long-term confinement of the plasma. Patent 3,005,767.

A process for treating common table salt with a chemical to prevent caking. Patent 2,990,246.

A method of adding an antistatic agent in the manufacture of phonograph records so that they do not collect dust. Patent 2,993,234.

A chemical spray that causes apple trees to bear fruit abundantly each year instead of every other year. Patent 2,978,838.

A nuclear reactor designed for merchant marine vessels enabling them to operate for more than three years without refueling. Patent 2,982,713.

A radar system, carried in an egg-shaped helicopter tied by a cable to a ground-based generator, to prevent low-flying aircraft from escaping early detection. Patent 2,995,740.

A system of flashing lights to help pilots avoid mid-air collisions. Patent 2,960,679.

A gritty mixture that can be applied to tires to provide gripping power without snow tires or chains. Patent 2,971,793.

A metal folding fire escape ladder for homes and small apartments that can be quickly hooked to the window and lowered to the ground. Patent 2,998,863.

A mechanism that engages an accessory brake when a vehicle door is opened. Patent 2,963,107.

For automobiles, a photoelectrically controlled rearview mirror that cuts down the glare from the headlights of the following car. Patent 3,000,262.

A method that will grow large quantities of animal tissue in short periods of time under controlled laboratory conditions. Patent 2,996,429.

A self-lighting cigarette that lights as it is withdrawn from the package. Patent 2,997,045.

A push-button operated electric-powered chair elevator alongside a staircase to transport persons with weak hearts or other ailments up and down the stairs. Patent 2,985,257.

A portable magnetic recorder that amplifies heart murmurs and sounds to aid doctors in diagnosing heart diseases. Patent 2,986,606.

A remotely controlled underwater craft for exploring the ocean depths that is provided with a television camera, a mechanical arm for salvage operations and a propulsion unit. Patent 2,987,893.

A restraining device that wraps around a cow's leg to prevent it from kicking when being milked. Patent 2,989,031.

A missile launch system to fire the Polaris missile from a submarine. Patent 2,989,899.

A fleet of underwater "blimps," connected by cables to a mother ship for power, to be used in transporting petroleum on the high seas. Patent 2,989,937.

A method of providing insecure footing for woodpeckers on utility poles to prevent damage by pecking. Patent 2,989,789.

An improved method for rocking the cradle electrically with a timer and an adjustment to control the size of the rocking arc. Patent 2,979,734.

A card-carrying case in which transparent plastic windows can be inserted for credit cards, calling cards and other similar cards. Patent 2,982,322.

A device to prevent a grocery cart from being taken beyond the store's parking lot. Patent 2,964,140.

A pillow with a center hollow, just large enough for a small radio, handkerchiefs or money. Patent 2,962,731.

A "glass" that shields night drivers from the glaring headlights of oncoming cars, yet does not block the light given off by street lights. Patent 2,976,759.

An electronic hearing aid so small it can fit completely inside the ear. Patent 2,967,913.

A camera with a flash unit that can be lowered into the camera when not in use. Patent 2,967,469.

## PSYCHIATRY AND PSYCHOLOGY

**Mass Panic in Disaster Reported to Be Myth**

Fear of mass panic, hysteria, and antisocial behavior such as looting or pillage in case of an enemy attack or disaster was reported to be a myth.

Sensory deprivation in a sound-proof totally dark cubicle was found to increase the skin's sensitivity to pain.

An electronic computer was produced to serve as a model of human personality; the computer can learn, forget, love, fear or be angry.

Conditioning causes the sweet taste of a sugarless sweetener to set in motion a chain of physiological events ordinarily initiated by the eating of sugar.

When experimental monkeys and cats had their brains split down the middle through the corpus callosum, the split brain acted as two separate brains, the right side learning one task while the left side learned something different.

A public school system received a \$61,900 grant to support a television program to teach parents how to teach pre-school children to read.

Visual practice is of value in learning to distinguish between two objects by touch alone, experiments with monkeys indicated.

Phenylketonuria, a metabolic defect that causes mental deficiency in human infants, was induced in baby monkeys, providing test animals for research on developing a satisfactory treatment for human cases.

Light was thrown on how to reduce international tensions by experiments in a boys' camp; antagonism between "enemy groups" in camp was reduced when all the boys had to work together to meet a threat to the safety of the whole camp.

A young baboon learned to count the beep tones he must let pass before pushing a button to stop the sound and release his reward.

A critical learning period was found to exist in puppies when it was discovered that a puppy must be handled before it is 14 weeks old or it can never get along with humans.

In order to develop a satisfying sex life as an adult it is necessary to have developed in early infancy a normal, non-sexual affection for another infant, experiments with baby monkeys showed.

Recidivism among psychopaths in hospitals in

Denmark, Holland and Maryland was reduced by a combination of group and individual psychotherapy under direction of an experienced psychiatrist.

Giant mental hospitals with thousands of patients must be replaced by small, open hospitals operated in local communities with emphasis on outpatient and aftercare facilities, a Joint Commission on Mental Illness and Health recommended.

A chemical, 10-methoxyharmalan, derived from serotonin, a nerve hormone in the brain, when administered to trained rats caused them to make mistakes and suffer from tremors.

A "false childhood psychosis" may result when a mother has an unconscious need to prolong the extreme closeness of her baby beyond the normal first year of infancy, it was reported.

Men who had worked their way up to managerial positions were found to have a greater incidence of illness on the job than those who stepped into the same kind of job right out of college.

## SPACE AND AERONAUTICS

**Cosmonauts Launched Into Earth Orbits**

The Russians launched the first manned spaceship into orbit on April 12, carrying cosmonaut Yuri Gagarin around the world once at heights up to 188 miles in 89 minutes.

The Russians launched the second man in orbit, cosmonaut Gherman Titov, who returned after circling the earth 17 times on Aug. 6-7.

The U.S. launched a 37.5 pound chimpanzee named Enos into earth orbit and successfully recovered the animal after two flights around the globe, paving the way for Marine Lt. Col. John H. Glenn to make the first U.S. manned orbital flight.

The first U.S. astronaut, U.S. Navy Cmdr. Alan B. Shepard Jr., was launched on a sub-orbital flight to a height of 115 miles on May 5.

The Russians launched the first Venus rocket probe.

The communications satellite Echo I, now in its second year in space, clearly registered by a change in its orbit the effect of a severe solar storm that increased the drag of the earth's atmosphere.

Scientists developed a new principle, called HIFOX, to increase the thrust of any chemical or nuclear engine used in rockets.

Scientists overcame one of the biggest problems facing future space travel by refining solid rocket fuel.

The Saturn rocket, which develops 1,300,000 pounds of thrust, was successfully flight tested.

To solve the difficulties with radio and radar in missiles, study was made of the theory that if certain low-frequency ion waves are created in the plasma forming a thin sheath around a missile, very high frequency radio and radar signals would be able to go through the plasma and make communication possible.

The S-3, scheduled to reach 50,000 miles into space at the farthest point from the earth, was developed, the first of a series to study electrons and protons in space and in the trapped radiation regions surrounding the earth.

Among the firsts in information provided by the Explorer VIII satellite that went 1,450 miles into space were the measurements of the shape and dimension of the ionized cloud around it, the measurement of the temperature of electrons in the ionosphere, and the finding that oxygen is the predominant gas in the atmosphere up to 650 miles.

The satellite Explorer X recorded a flare on the sun and measured a resulting magnetic storm on earth, and also found that interstellar space sometimes contains magnetic fields of greater strength than expected.

Twenty-seven nations at the invitation of the United States attended a workshop to learn how to use the weather information from the Tiros III satellite and 100 nations were invited to participate in a special exchange program for those interested in receiving photographs of cloud formations and storm centers.

Tiros II and Tiros III were provided with special controls that enable these satellites to maintain more efficient orientation for taking and relaying data and pictures, and with equipment to obtain radiation data that has been found useful in determining the presence and heights of clouds.

Two new weather satellites in addition to Tiros III were planned, Nimbus to be launched in polar orbit and a 24-hour satellite that would stay over the same spot on earth at all times to send continuous weather information back to earth.

The development by the United States of a world-wide operational satellite communications system was proposed.

Plans were made for launching by the U. S. of the first satellite to be instrumented by scientists of a foreign country.

The density of neutrons was measured by boron detectors at altitudes from 70 to 1,200 miles.

A 14-pound Scout, the first U. S. satellite to be launched by a solid-fuel rocket, was placed in orbit, the first of several in a developmental series.

The solid-fuel rocket, Blue Scout, carried a 172-pound scientific payload to an altitude of 1,580 nautical miles successfully.

Transit IV-A, a navigation satellite with the first nuclear-powered instruments, is now circling the earth at from 550 to 629 miles.

Living organisms, algae and human tissue culture, were recovered after orbiting the earth in Discoverer satellites.

Using solar energy to convert via algae the carbon dioxide exhaled by an astronaut into oxygen was the basis of a new photosynthetic gas exchange device that was developed.

A new method for using algae in space ve-

hicles by agitating the culture to speed up the photosynthetic reaction was developed.

Experiments with a mouse that survived 66 days in a closed environment brought closer to actuality the use of algae as a source of oxygen for man traveling in space.

Rocket shots as well as the U-2 and rocket-driven airplanes such as the X-15 have emphasized the need for an international space treaty and a clear definition of the boundaries of national air space. The question of international law for satellites sent into space without permission from other nations remained unsettled.

The crystal structure of silicon carried in the recovered capsule of the Discoverer XXVI satellite was found to have changed when it was bombarded by protons in space.

Sapphire sheathing made up of thousands of pieces of man-made sapphire was developed to cover communications satellites to protect the solar cells from being weakened by space radiation.

A Yo-yo method consisting of two pieces of wire with weights on the ends attached to the middle of a satellite was developed to reduce the spin of a satellite after launching.

A new training device that duplicates the visual environment of outer space was proposed for future astronauts since actual space vehicles are not practical for training purposes.

A new kind of solar cell that collects the sun's rays on a parabolic mirror and concentrates them on a mercury boiler was under development to power satellites or deep space probes.

A doughnut-shaped inflatable fabric tubing was devised to cushion the landing of a space vehicle on the moon or planets.

A plan was developed for chemical analysis of the moon's surface through gas chromatography.

The X-15 rocket ship set a speed record for controlled aircraft of 4,093 miles an hour at 95,800 feet, with skin temperatures of 1,000 degrees Fahrenheit or more.

A new lighting system for airplane runways was installed to reduce the dangers of night and limited visibility landings.

The world's first airplane with wings that "inhale" air and exhaust it rearward was designed to reduce turbulence and friction drag.

Tests were conducted with scale models to investigate the use of shallow ponds to stop jet transports that overrun designated landing or take-off areas.

#### GENERAL

## Increase of Science Shown in Statistics

About \$12.4 billion was spent on all kinds of research and development in 1959, 2.6% of the U. S. gross national product.

It was estimated that \$9.1 billion for supporting scientific research and development would be spent by the U. S. Government during fiscal 1961.

U. S. industry spent about \$9.4 billion for scientific research and development in 1959, 15% more than in the previous year.

Forty percent of the 100,000 science and engineering faculty members at U. S. colleges and universities were concentrated in only 67 institutions, all with enrollments of 10,000 or more.

An appropriation of \$275,000,000 for fiscal 1962 was asked of Congress by the National Science Foundation, the largest part of the increase to be allocated to basic scientific research.

Approximately a quarter of the more than 1,500 daily and Sunday newspapers in the U. S. have a reporter who gives special attention to science, medicine and technology.

U. S. brides and bridegrooms in 1960 were younger and closer in age at first marriage than those in any other urban-industrialized country in the world.

More than 5,300 doctor's degrees were awarded in the U. S. in 1959, an all-time high.

The average U. S. scientist in 1960 was a \$9,000 a year man.

The ideal rate of scientific growth in the U. S. during the next decade was priced at \$50 billion by the National Science Foundation.

• Science News Letter, 80:397 December 16, 1961

#### GENERAL SCIENCE

# 1961 Advances in Science

**Human beings flung into space as conquest of universe continues. Measles vaccines ready. Element 103 discovered. Manlike creature dates from earlier age, Watson Davis reports.**

➤ **MAN'S PENETRATION** into space dominated the achievements in science and technology during 1961 as a by-product of the military preparations of both the East and the West.

Maintaining its step ahead in the launching of spaceships, the Soviet Union put two men into orbit around the earth. The United States shot into the upper atmosphere and successfully recovered two of its astronauts.

The most powerful rocket in the world was Saturn, developing 1,300,000 pounds of thrust, which made a successful flight test, foreshadowing interplanetary probes that will reach Venus and Mars probably in 1962.

A method of stopping and starting rockets powered by solid fuels, developed by the National Aeronautics and Space Administration's Lewis Research Center in Cleveland, when applied, will overcome one of the big problems facing future space travel.

The X-15 U. S. experimental rocket plane made a world speed record of 4,093 miles an hour, and even at 95,800 feet altitude, where the air is thin, such high speeds caused the outside of the plane to rise to a heat of 1100 degrees Fahrenheit.

A rise in the world's apprehension and fear of nuclear war occurred after Soviet Russia broke the atomic testing moratorium that had been in effect and carried on more than a score of test explosions, one of them rated at the nuclear equivalent of 55 to 60 megatons of TNT. The United States resumed nuclear testing but confined its atomic explosions to below ground where the radioactive debris will not be distributed into the atmosphere and endanger the heredity of future generations.

Some of the strontium-90 created by the Russian bomb fell to earth upon Russia itself as well as the northern parts of the United States and Europe, but much of the danger-

ous debris will remain in the upper atmosphere until it is washed down by the rains of the spring of 1962 and later.

Development by the U. S. Department of Agriculture (using prior Canadian and American studies) of a process to remove from milk 98% of the strontium-90 that contaminates it during the time of heavy atomic explosion fallout is a promising guard against both atomic tests and the use of atomic bombs in war.

The space age is four years old, dated from the time the first artificial satellite was launched around the earth. The score on satellites is predominantly in favor of the U. S. in comparison with the USSR. The U. S. has launched over three times as many satellites and space probes as the USSR. In the fall of 1961, the U. S. had 30 satellites in earth orbit and Russia only one; each had two probes in solar orbit. Twelve of the U. S. satellites were still transmitting scientific information back to the earth while none of the USSR satellites were transmitting. The passive communications satellite Echo-I, launched Aug. 12, 1960, continued to circle the earth regularly and its lifetime