

AERONAUTICS

Straight Up Take-Offs Made Successfully

Fighter planes that take off straight up and land tail-first successfully passed Navy tests, making possible extensive air defense without large, costly and vulnerable landing fields.

The U. S. Air Force finished outfitting all of its fighter wings with jet planes.

Vigorous, sustained attacks were made on the formidable technical problems involved in harnessing nuclear energy for aircraft propulsion with a view to making possible nonstop supersonic flight to any point in the world and return.

The Air Force B-61 Matador guided missile was successfully packaged in interchangeable sections to facilitate storage, shipping and operation.

America's first jetliner was test flown, and the Air Force ordered production of its military equivalent.

A new type of Navy plane with unusual "coke-bottle" fuselage took to the air.

A convertiplane was announced that uses a helicopter rotor to take off vertically, and then flies forward pushed by a conventional airplane engine.

A navigational compass that works on the sky's polarized light was developed for use by commercial airlines flying in the Arctic twilight.

Radar tested in airliners promised improved service and comfort in stormy weather.

A 600-mile-an-hour trainer plane for jet pilots has been developed to give students the feel of "swishy" flying without sacrificing the safety of slow-speed training planes.

A radar-type altimeter was developed that tells a pilot instantly his height above ground, warning him of decreased clearance as he nears mountain peaks.

A push-button parachute system was perfected that enables a transport pilot to drop as much as 20 tons of cargo.

A plane with half-barrel-shaped dips in its wings was successfully flown at only 11 miles an hour although it can top 180.

Brakes for jet planes, using reverse engine thrust, were developed as an alternative to longer landing strips.

An electronic machine was devised to help solve the problem of holding of aircraft over heavily used airports; it helps in guiding planes into the final approach at 30-second intervals.

A jet engine test laboratory was built that can simulate temperatures and atmospheric conditions from sea level to 80,000 feet.

A slimmer parachute pack, requiring half the space of earlier types, will make it possible to reduce by \$3,000 the cost of Navy fighter planes.

Gales of 12,000 miles an hour, about 16 times the speed of sound, were reached in a hypersonic wind tunnel.

Carefully placed rockets can snap a plane out of a tailspin in an emergency, it was demonstrated.

An accurate navigational system was developed that permits a helicopter pilot to land within arm's reach of a dime.

A floating heliport that can be placed on flat-topped office buildings without reinforcing the building's frame was tested.

A small booster motor was developed to permit helicopters to lift heavier loads in mountains where the air is thin.

An unofficial world helicopter altitude record of 24,500 feet was set in Sikorsky XH-39 by the same flyer who previously set an unofficial helicopter speed record of 156.005 miles an hour.



SPEED'S EFFECT—When a man comes to a rapid stop from the unmatched ground speed of 421 miles per hour, this is how the 22-g deceleration distorts his face. Recorded by a high speed camera, the face in both pictures is that of Lt. Col. John P. Stapp, U. S. Air Force aero medical research scientist, in the rocket-propelled sled at Holloman Air Development Center. The left picture was taken before the start; the right one, at the peak of the deceleration.

The highest speed on the ground was attained—421 miles per hour—in tests aimed at making supersonic bailouts safer.

A 616.208 miles-an-hour speed record was set Sept. 4 between Edwards Air Force Base, Calif., and Dayton, Ohio, in a Republic F-84F, thus winning the Bendix Trophy Race.

A new National Aircraft Show speed record over a 100-kilometer course was set Sept. 3 at 692.823 miles an hour in a North American F-86H, winning the Thompson trophy.

The U. S. already has all the know-how for launching a small earth satellite, or artificial moon, for a flight of limited duration, it was stated.

Scheduled commercial airline flights were started over the once hazardous Arctic between Copenhagen and Los Angeles.

ANTHROPOLOGY-ARCHAEOLOGY

Two Important Finds Made in Egypt

Two very important finds were made in Egypt: one of the solar boats intended to carry the Pharaoh Cheops to heaven, and a new step pyramid at Sakkara containing an apparently undisturbed golden alabaster coffin, at first believed to be that of Pharaoh Sankhet but which turned out to be empty.

The most ancient American skull, at least 12,000 years old and possibly much older, was found near Midland, Texas, in association with ancient fossil animal bones and Folsom points.

Remains of a 208-house Arctic village occupied by the vanished Dorset people for a period of at least 2,000 years before the coming of the Thule Eskimos were found north of Hudson Bay in Canada; the houses were large and rectangular, heated by stone indoor fireplaces and lighted by small lamps.

Tiny stone tools, with microscopic cutting edge, were made by flaking off another small engraving tool called a "burin," and used in quantity by a prehistoric Arctic people to carve on ivory, it was reported.

Evidence was found on Cornwallis Island of two early waves of migration from Alaska across the Canadian Arctic to Greenland, the earliest being of the Dorset people, who were followed after a long interval by the Thule Eskimos.

Positive confirmation for the existence of man as a hunter of now-extinct mammoths in prehistoric Mexico was unearthed near the Texpexpan Man site when fossilized bones of a mammoth were found with the stone weapons that felled the beast.

Examination of the Australopithecine sites in South Africa indicated that these ape-men were not tool-makers, and were not old enough geologically to be ancestors of the first tool-makers with whom they may have lived contemporaneously.

A pleasant cave home with southern exposure in Iraq was explored and determined to be one of the oldest continuously inhabited homes in the world, having been lived in since 70,000 or, possibly, 150,000 years ago.

Artists' tools used by a previously unknown people who lived in the Old Stone Age, just after the days of Neanderthal Man, were found in Shanidar Cave in northern Iraq.

A rock shelter occupied nearly 11,000 years ago was found in Illinois and determined to be the oldest dated Indian home east of the Mississippi.

Evidence was reported to indicate that two great migrations, one of men and their new ideas about 1,000 B.C. and the other of ideas alone about 2,000 years later, were responsible for the cultural development of the native people of eastern and midwestern United States.

Two stone images of seated figures, the style of which suggests strongly a link between the Etowah people who made them and the ancient Aztecs of Mexico, were found in Georgia.

The condition of the breast bone of the human skeleton was found to indicate the age of the individual at time of death, provided he was a child or young adult—an aid in identifying war dead.

A tabulation of body size of aboriginal inhabitants of North and South America showed that people tend to be larger with distance away

from the tropics, but decrease in size within the Arctic regions.

Excavations for a new block of buildings in the city of London revealed ruins of an ancient Roman temple containing interesting art and religious objects that included sculptures of the heathen god Mithras and the head of a Roman youth.

At Pompeii, a large cemetery of early Christian times was discovered and four villas were opened; finds included a statue of Venus wearing a two-piece costume similar to a Bikini bathing suit.

The largest terra cotta vase ever found—four feet, eight inches tall and decorated with scenes from Greek mythology—was excavated near Athens and assembled from 228 fragments.

Ten houses of a small settlement estimated to be at least 5,000 years old were excavated near Beersheba; below the floors were silos containing wheat, barley, grape seeds and lentils, and evidence of trade in copper was also found.

Eleven stone plates of an ancient lithophone were found in Viet-Nam and attributed to the Bacsonians, a tropical group who lived in Indo-China 5,000 to 8,000 years ago; assembled in Paris, the plates were found to resemble a modern xylophone.

The level of development of a culture was found to be directly dependent on the agricultural potentiality of the land occupied by the people.

Discovery was announced of a hundred-mile-long canal system paralleling the Euphrates River in ancient Mesopotamia that was used for navigation and water supply six or seven thousand years ago.

Realistic "family portraits" modeled in plaster on bases of human skulls were found in the

ancient city of Jericho, where they were left by a people who lived there before men made pottery, probably 8,000 years ago.

Rare and spectacular gold ornaments of the Chinu period, 400 to 700 years ago, were found in a Peruvian grave of a man who was apparently a goldsmith in life, along with a gold slab suitable for use in the "cire perdue" process.

Evidence was found in a rock shelter in the Dordogne region of southern France for a change in ancient man's diet from 25,000 years ago, when horse meat was the principal feature of the menu, to 18,000 years ago, when reindeer had replaced the horse.

Restudy of the people in a South Pacific village who had been observed as children 25 years ago showed a dramatic social change from Stone Age to Atomic Age in a single generation.

Evidence was found on Japan's north coast of a vanished people who never suffered from tooth decay.

A new and romantic branch of archaeology, "sea digging," was advanced with the salvage of archaeological treasures from ancient sunken ships off the coast of France.

Man has lived in America for much longer than the 10,000 to 12,000 years thought previously, it was proved by radiocarbon dating of charcoal of human origin from Tule Springs, Nevada, at 23,000 years and from Sandia Cave, New Mexico, at 26,000 years.

ASTRONOMY

Radio Waves Show Milky Way Structure

For the first time, radio waves generated by interstellar hydrogen were used to reveal the structure of the Milky Way galaxy toward the center.

A systematic search was begun for small satellites that may be circling the earth and could serve as platforms for space ships and scientific observations.

Plans for a radio telescope observatory, to be operated jointly by several universities, were discussed.

An advisory panel for the proposed national astronomical observatory was appointed, part of the extensive and valuable program of support for astronomical research by the National Science Foundation.

Investigation was begun of methods for exploring at least twice as far into space as now possible by finding new methods combining photography and electronics.

Astronomers borrowed from aeronautical engineers the shock tube, used in design of guided missiles, to duplicate in the laboratory temperatures found in the sun and other stars.

Several new radio stars were discovered, including three very intense ones with nebulosities.

Using very sensitive radio telescopes, a search was made for deuterium in space between the stars.

Twin stars, born some 2,600,000 years ago, were spotted in the Orion Nebula, thus giving evidence to support the theory of current stellar creation.

The first phase of a sky-mapping project that will, about 1990, give the true rotation and mass of the Milky Way was completed.

The list of stars with appreciable motion was increased by 19,000.

A large number of slowly brightening, flare-like stars in the nebulosities of Orion were discovered and measured.

The study of radial velocities, or red shifts, of 580 galaxies was completed.

A color-magnitude array, reaching to stars of

less candle power than the sun, was completed for the globular cluster Messier 3.

Direct evidence was found that particles are ejected from the sun with speeds up to one-fifth that of light; these particles can provoke changes in the earth's weather, it was reported.

A new theory was advanced to account for both the "canals" and dark green markings on Mars as wind-blown streaks and patches of volcanic dust.

Evidence was found that the sun's visible surface, or photosphere, has a circulation which causes changes in the rate of its rotation at the solar equator.

A telescope was built from a new design having a reflector-corrector lens attachment that permits wide-angle photographs on flat plates.

It is now possible, it was announced, to make an artificial meteor trail in the heavens by spraying sodium from a man-made satellite, thus providing scientists on earth with a picture of winds, turbulence and temperatures in the upper atmosphere.

The patterns formed by whirling disks in liquid metals, placed in powerful magnetic fields, were used to study the forces at work in the solar system.

A new Pulkovo Observatory, built in Russia on the site of the war ruins of a world-famous institution, was dedicated with an important international scientific meeting that was attended by two American astronomers.

A total eclipse of the sun on June 30 was observed on a wide front; a ten-station program of the U. S. Air Force distributed observers all the way from Ontario through Labrador, Greenland and Scandinavia to Iran.

Temperature of the sun's corona may be even higher than 1,000,000 degrees Centigrade, it was indicated when the yellow emission line caused by calcium atoms stripped of 14 electrons was observed.

A unimagnetic pole on the sun's surface was found to be linked with geomagnetic activity on the earth.

A three-year tracking was completed of a solar "M" region, which returns in 27-day cycles, causing geomagnetic storms on earth.

First direct observational evidence showed that Jupiter's atmosphere consists mainly of hydrogen and helium, not methane and ammonia as was previously thought.

Mars approached on July 2 to within 39,740,000 miles.

Seven new comets were sighted in the sky, and five periodic comets were re-observed.

Five novae, or exploding stars, and three supernovae were observed during the year.

An asteroid, Athalia, was rediscovered after having been lost for 50 years.

BIOLOGICAL SCIENCES

Corn Found a Native Of Western Hemisphere

Corn is a native of this hemisphere and has been grown here for at least 60,000 years, study of fossil pollen from 200 feet below Mexico City showed.

An ancient puzzle to botanists was solved when it was found that fat is produced in the chloroplast, site of photosynthesis; details of the chloroplast also showed up in photographs made with the electron microscope.

A new theory was proposed which suggested that the process of photosynthesis is essentially a photoelectric current flowing from water through the chlorophyll to disulfide intimately associated with the chlorophyll molecule.

A chemical structure was proposed for desoxyribonucleic acid, or DNA, substance essential in the dividing cells involved in life;



17-DAY TWINS — *The youngest human twin embryos yet seen are shown in this photograph of the gestation sac. The embryos are the small round objects, one on the floor, the other on the roof of the chorionic cavity which is the dark spot near the top of the picture.*

this points the way to solution of the fundamental problem of how life is handed on.

The B vitamins in a grain of wheat were found to be concentrated in a single one of the outer layers.

A single electron such as hits a television picture screen has enough energy to keep a single bacterium moving for about three minutes, it was calculated.

Four generations of fatherless female desert locusts were produced in the laboratory.

A plant absorbs its nutrients from the soil at a point just above the tip of the root, where root hairs are present, a fact revealed when plants were fed radioactive nutrients and then radiograms made of the plants.

Natural plant hybridization produced plants, found in north central Tennessee, that do not resemble either parent after many generations.

Disease-causing fungi were found to have chitin as the material for the skeleton of their cell walls.

Bull frogs were found to show great resistance to sarin, a nerve gas, surviving more than a thousand times the dose that would kill a man.

An international expedition marked whales so that more could be learned about the rate of interchange between whale populations of different regions, the age and rate of growth of whales, and the ratio of number killed to total population.

Two new cattle diseases, an influenza-like ailment and sporadic bovine encephalomyelitis, were reported to present threats to human health.

Carbon of living origin found in Canadian slates of early pre-Cambrian time, or 2,500,000,000 years ago, pushed back the estimated time of life's beginning.

A new plant genus with a green and purple flower, belonging to the family *Umbelliferae*, was discovered in northeastern Mexico.

Rabies vaccine for cattle was made available.

New insecticides were developed that can be safely fed to cattle to destroy their parasitic grubs.

Chemical extenders added to present insecticides were found to prolong their effectiveness to an entire season.

DDT-resistant flies developed through survival of the fittest; it was found that the resistant insects are capable of developing an enzyme chemical that serves them as an antidote to the poison.

Infestations of the Khapra beetle, a stored-grain destroyer native to India, Ceylon and Malaya, were reported in 11 counties in California, Arizona and New Mexico; apparently it invaded the United States in 1946, but remained undetected for seven years.

An insect pest, attacking cotton in Texas and known locally as the brown cotton leafworm, was identified as *Acontia dacia* Druce.

America's citrus industry was declared seriously threatened by a nematode called "spreading decline."

The Mexican fruit fly made a new invasion into California.

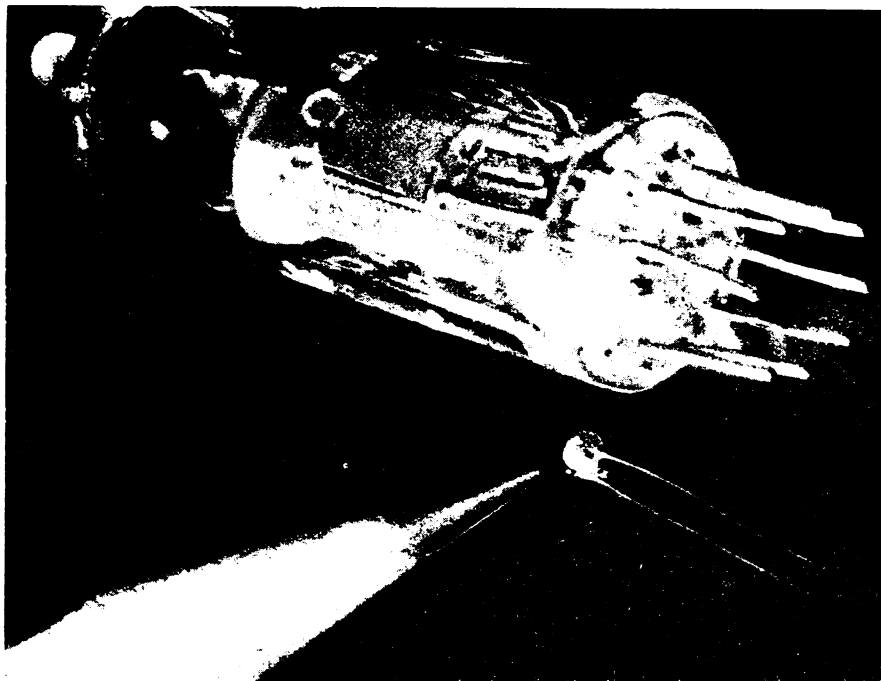
Atomic radiation was found to cause cancer growth in tobacco.

A new virus disease threat to the brain and nervous system of dogs was discovered in Australia.

Research attacks on a sheep disease, blue tongue, included development of a vaccine for immunization and the discovery that mosquitoes spread the virus.

The pink bollworm, pest of cotton, continued to spread throughout the South and was attacked by biological warfare in the form of a virus disease of the insect.

Compressed air was forced to the bottom of



MIDGET RECTIFIER—The tiny object under the pencil point is a germanium-junction rectifier made by a disc of indium fused to a rectangular bit of germanium. It has no filament to burn out and no glass tube to break, as does the vacuum tube shown for comparison. It can be used to operate hearing aids and other subminiature devices.

ice-bound lakes, bringing the warmer water at the bottom up to melt the ice and prevent winter-kill of fish.

Three rare birds threatened with extinction were reported increasing in numbers—the whooping cranes, the trumpeter swans and the Hawaiian nene.

CHEMISTRY-PHYSICS

Convert Atomic Energy Directly Into Electricity

Atomic energy was converted directly into electricity by using high-speed electrons emitted by strontium 90 to bombard tiny transistors which, in turn, emit large numbers of slow-moving electrons to give a very small electric current.

An atomic battery was developed that uses thermocouples to convert the heat of its radioactive polonium core into a small voltage electric current.

A semiconductor device made of silicon was successfully used to convert sunlight directly into electricity; another solar battery was produced, using a crystal of cadmium sulfide.

Element 99 was produced by bombarding uranium 238 with stripped nitrogen atoms, and identified.

Different isotopes of element 100 were independently produced in the United States and in Sweden.

Element 43, technetium, was found to become superconductive at the relatively high temperature for this phenomenon of 11.2 on the absolute scale.

Cesium 137 was extracted from plutonium waste products and made into a 1,540 Curie source for gamma ray beam therapy.

New evidence for the atomic ghost particle, the neutrino, which has been postulated for years, was found.

Synthesis was achieved for strychnine and lignin, and a new method for synthesis of morphine used a simpler chemical as the starting point.

Steroids related to those obtained from the adrenal cortex have been synthesized with halogenated substituents and show even greater promise for clinical use than the well-known cortisone and hydrocortisone.

Discovery of part of the molecular structure of ACTH brought nearer the synthesis of this pituitary hormone.

The bevatron, 6,000,000,000 - electron - volt atom smasher, started operation at Berkeley, Calif.

A small atom smasher using the strong focusing principle was under construction at Ithaca, N. Y.

Plans were made by the Atomic Energy Commission for the building of five types of large-scale reactors, and construction was begun on three of them; the types are: the pressurized-water reactor, the sodium-graphite reactor, the boiling-water reactor, the homogeneous reactor and the experimental breeder reactor.

The boiling-water atomic reactor proved to be self-regulating, so that it will not "run away," causing a disaster, experiment showed.

A transistor was successfully made from silicon, promising a cheaper replacement for the costly germanium transistor.

A new family of silicone compounds was produced when carbon was made to join silicon without oxygen as an intermediary.

An axicon, a universal-focus lens, was produced; in the form of a glass cone it is suitable for use in a telescope to bring objects distant from each other into focus simultaneously.

Discoveries were announced of a fourth and fifth type of abnormal adult human hemoglobin that differ from the normal variety in ways similar to those that differentiate the hemoglobins of patients with sickle cell anemia;

chemical bases for these differences were elucidated for three of the adult forms.

Using isotopes, discovery was made of the steps by which nature produces rubber in the growing plant, an advance toward producing the equivalent of natural rubber.

A new laboratory was dedicated having apparatus for radiocarbon dating by a new gaseous method that is more accurate and covers a longer time scale.

A gap was filled in the electromagnetic spectrum by the generation of millimeter waves, about six-thousandths of an inch long, which fall between the microwaves that carry television programs and the shortest waves of infrared radiation.

A twin birth was announced for the world of the atom when it was found that the relatively heavy hyperon and the lighter K particle appear together when a proton smashes into a negative pi meson.

Discovery was made that atomic particles passing near an atom's nucleus set up waves on the nucleus' surface and these bulges travel around the nucleus at definite speeds.

Two out of three attempts to confirm the findings on which Einstein based his theory of general relativity failed.

International agreement was reached on new names for the fundamental particles of matter and a system set up for naming those yet to be discovered.

The sun was discovered to be the source of a very small percentage of cosmic rays bombarding the earth.

The Nobel Prize in chemistry for 1954 was awarded to Dr. Linus Pauling of California Institute of Technology for his work on the chemical bond and on the nuclear forces that hold all matter together.

The Nobel Prize in physics for 1954 was awarded jointly to German-born Max Born and Walter Bothe of Heidelberg, West Germany, for fundamental research in quantum mechanics and for discoveries resulting from coincidence counting, respectively.

MEDICAL SCIENCES

Death Rate From Cancer Double Among Smokers

More than double the death rate from cancer and nearly double the death rate from coronary artery disease was found among heavy, pack-a-day or more cigarette smokers compared to non-smokers in a two and a half year statistical study of 187,766 men aged 50 to 70.

The Tobacco Industry Research Committee was formed to finance research on the relation of tobacco smoking to health.

Chewing tobacco and snuff were reported associated with cancers of the mouth.

A million and a half U. S. grade school children took part in mass trials of a vaccine against poliomyelitis; evaluation of the test is due for announcement in 1955.

Experts failed to find beneficial effects of mass inoculations with gamma globulin on spread or severity of polio.

A chemical that can step up the anti-nerve gas action of atropine two and one-quarter times was discovered in pentamethonium, short for pentamethylene bistrimethyl ammonium dibromide, relative of one of the newer drugs for lowering high blood pressure, hexamethonium.

Parrot fever and ornithosis can be kept from spreading to humans by treating bird-breeding stocks with the antibiotics chlortetracycline or tetracycline.

A ban on routine use of oxygen for premature babies was advised to prevent blinding retrolental fibroplasia.

The year's new drugs for controlling high blood pressure were: pentapyrrolidinium, alseroxylon, andromedotoxin, Su-3088, or dimethylaminoethyl tetrachloroisindolene bismethochloride, and a combination of apresoline and serpasil.

Running hot or cold water into a balloon in the stomach was reported as a simple, safe method for quickly changing body temperature

that is adaptable to treatment of fever or freezing conditions, as well as for operations on heart and great blood vessels.

Running ice water or ice-cold salt water into the chest cavity was reported as simple and safe method of refrigerating patients for operations on heart.

A blood-pressure-reducing rauwolfia drug, called serpasil, was reported helpful in calming excited mental patients and potentially capable of improving their mental condition.

Chlorpromazine was reported effective in quieting disturbed mental patients, stopping intractable hiccups and augmenting the effect of narcotic drugs in relieving pain in cancer and other conditions.

Chemical analysis of opium ash was found a means of detecting the geographic origin of opium and a consequent aid in opium traffic control.

For saving victims of barbiturate overdose, a mixture of beta beta methyl ethyl glutarimide, or NP 13 for short, with 2-4 diamino-5-phenyl thiazole was developed.

The human heart's "equipment" for a lifetime of beating without prolonged rest was discovered to consist of extremely small fibers, called sarcosomes, within the heart muscle filaments.

A blister and burn pain chemical was discovered in blood plasma.

Positron annihilation and a coincidence-counting system were used to develop a method for early detection of brain tumors with radioactive arsenic.

Patients whose eyesight is threatened by tears or holes in the retina can be helped by treatment with intense light, it was reported.

An anti-tuberculosis vaccine from powdered dead germs and a double drug combination, isoniazid with pyrazinamide, for eradicating the germs from the body were announced.

Glutamine and asparagine were tried with promising results in a new attack on epilepsy based on the discovery that failure to keep enough glutamic acid in the brain cells is most important of the three biochemical defects causing epilepsy.

Blood plasma expander from *Bacillus subtilis* was reported ten times more effective than serum albumin for attracting water into blood stream and, therefore, promising for treating burn-shocked patients.

The earliest human twin embryos ever seen, 17 days old from time of conception, were discovered and identified as identical twins formed inside a single blastocyst.

Unusual births included head-joined Siamese twins and a two-headed, four-armed baby.

A woman with Rh negative blood whose mother had Rh positive blood is likely to develop some tolerance to Rh positive blood, it was reported.

Cross circulation, in which patient and donor are linked artery to artery and vein to vein with pumps to control the blood transfer, was developed and used 21 times for operations on the temporarily blood-free heart.

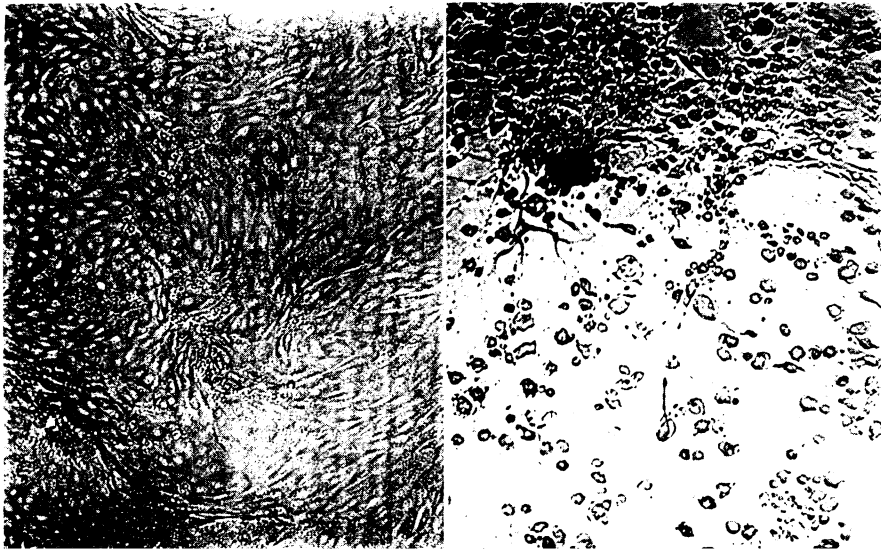
A single diet was designed for nourishing all forms of life, from man to bacteria, viruses and plants.

Tips of lung arteries were found to act as "catch-traps," holding masses of sludged blood cells.

A remodeled sulfa drug, called Diamox, already known to be a good diuretic, was reported helpful in the serious eye disease, glaucoma, and chronic emphysema of lungs.

The successful transplantation of an unerupted wisdom tooth to replace a lost first permanent molar was reported in more than 100 cases.

Success in grafting frozen male sex glands



POLIO DAMAGE—On the left are shown live cells from monkey kidneys clinging to the walls of a test tube. The picture on the right was taken 48 hours after live polio virus had been added. The virus attacks the cells, drawing on them for nutrition. The cells become enlarged and misshapen, and finally burst and disappear, releasing more virus to attack other cells. Dr. H. Fieldsteel of the Pitman-Moore Co., Indianapolis, took these photographs.

in rats hinted possible success in future human gland grafting.

Benpyrinium bromide, a cholinergic agent, was reported 100% accurate in detecting early pregnancy.

A new pain-relieving drug, MRD-125, or Dolitrone, that does not put the patient completely to sleep was announced.

The first serial cultivation of normal human cells directly on glass in a liquid medium was announced.

The first service-connected case of leprosy in a World War II veteran was discovered, causing prediction of more to come.

The development of an electronic magnet for removing particles of non-iron metal fragments from eyes was announced.

The first "atom-bomb-proofed" building in the nation's capital is the Armed Forces Institute of Pathology building at Walter Reed Army Medical Center.

The 1954 Nobel Prize in medicine was awarded to Drs. John F. Enders and Thomas H. Weller, Children's Medical Center, Boston, and Dr. Frederick C. Robbins, Western Reserve University School of Medicine, Cleveland, for success in growing poliomyelitis viruses outside the human body in non-nervous tissue culture.

Toxoplasmosis was shown to be a cause of granulomatous uveitis, a blinding eye disease, and 25 out of 29 patients benefited from combined therapy with pyrimethamine and sulfadiazine.

Metacortandracin and metacortandralone, new synthetic crystalline steroids, were found to be several times as effective as cortisone in rheumatoid arthritis and without significant side effects.

In the microsomes of liver cells, a metabolic system was discovered that accounts for the body's inactivation of the vast majority of drugs.

PSYCHIATRY-PSYCHOLOGY

Nose Can Serve As Chemical Analyzer

Evidence was found that color and brightness are received by the same elements in the eye, but are transmitted to the brain over separate, branched pathways.

Among the cones of the eye are some that are particularly sensitive to violet light, experiments demonstrated.

The nose can serve as a chemical analyzer, identifying the component parts of an odorous mixture, it was found.

Vision takes place, much as the picture is formed on a television screen, by the tracing of a series of light signals, with the alpha rhythm of brain waves governing the timing of the signals, it was suggested.

The theory was proposed that the rods of the eyes are made up of compartments, each of which is discharged by a single quantum of light and cannot be restored until all its rhodopsin is back to normal, explaining why the sensitivity of the dark-adapted eye is lost in such big jumps.

Depth or distance between two objects is seen in two different ways, experiment showed. One method, precise and quantitative, depends upon the difference between the two images received through the two eyes and the anatomical arrangement of the two eyes and the brain; the other, more subjective and vague, depends upon previous experience and is aided by movement of the eyes.

Love of exploration and manipulation is a powerful motive governing monkeys, and presumably also humans, that has generally been

neglected by psychologists, it was reported.

A machine was developed for efficiently teaching children arithmetic, spelling and reading by providing immediate reward for a correct response.

Hunger and thirst are interrelated, it was shown by experiments on pigeons when thirst ruined their appetite and over-drinking brought expressions of hunger.

"Cognitive conditioning," or the production by conditioning of a generalized attitude or frame of mind that is basically unconscious, was demonstrated.

Soft living under civilized conditions may make men physiologically unfit for rough life or combat, experiments with wild and laboratory rats suggested.

Soldiers who make the best fighters in combat were found to be characterized by all-round superiority, mentally, physically and socially.

Experiment revealed that effective leadership depends upon acceptance by followers as well as on special qualities or skills of the leader, and different tasks may require different relationships between leader and led.

Keeping the muscles tense was found to be no particular advantage or disadvantage in learning to perform a psychomotor task.

Rats gentled as babies were found to stand stress better when grown than those not gentled, probably due to decreased ACTH output.

When old people with senile dementia lose their ability to understand difficult words, it is due to localized brain damage in addition to the generalized deterioration of age.

Masculine men and feminine women do not differ significantly in their response to sex symbols when they do not understand the purpose of the test, it was found.

The Rorschach test was successfully used to distinguish schizophrenic patients from neurotics.

A test of the meaning of concepts, called the Semantic Differential, was shown to be very promising for evaluating personality changes with psychotherapy.

Internal conflict was shown to be connected with awareness of relevant pictures exposed very briefly.

The frequency at which a light must be flashed to be seen not as a flickering but as a continuous light was found to be significantly higher and less variable for schizophrenic patients than for parietic patients (with brain damage).

A double slot machine, operated through cooperation between two persons, was found capable of measuring the improvement of mentally ill patients and of stimulating the improvement.

Apathetic or stuporous mental patients were restored to interest in their surroundings by group therapy.

Brain injury in a newborn baby was successfully diagnosed by his response to a mild electric current applied to one leg.

The cause of many cases of mental illness of obscure origin was found to be horse sleeping sickness.

EARTH SCIENCES

Discover Plant Fossils 2,000,000,000 Years Old

Study of the tritium content of various samples of water showed that falling rain has stayed aloft as moisture for about three weeks, that deep wells and volcanoes can produce ancient water more than 50 years old, and that rain mixes with ocean water only to a depth of about 150 feet.

Primitive plant fossils more than 2,000,000,-

000 years old were discovered on the northern shore of Lake Superior.

A rare mineral, named ordonezite, was discovered in a Mexican tin mine; an even rarer mineral, mosesite, was rediscovered in a Mexican mercury mine.

A golden-brown gem stone, named sinhalite, was found in Ceylon.

International cooperation in observing worldwide geophysical conditions, including polar region phenomena, was planned for 1957-58, to be known as the International Geophysical Year.

Evidence was reported that the Arctic ice pack rotates in a clockwise direction, promising future problems regarding sovereignty over floating weather stations and military bases.

A theory was advanced, and confirmed by laboratory experiment with beakers of boiling water, that tiny bubbles in the molten lava trigger the eruption of volcanoes.

Volcanic eruptions included one of Merapi in Java, famous as a man killer.

A volcanic eruption of a tiny island off the coast of Mexico that destroyed all but less than 200 plants of five species provided scientists with a natural laboratory in which to study plant migration and revegetation.

Oil deposits can be located by examining bacteria in the soil.

A numerical weather prediction unit was established to prepare weather forecasts with the aid of an electronic computer.

Research on rain making continued: seeding clouds with silver iodide sprayed from ground generators proved of limited value under ordinary atmospheric conditions, and research on bursting sea water bubbles suggested the use of common salt for seeding clouds under certain conditions.

A theory that nature uses meteoric dust for natural cloud seeding was suggested by a study of rainfall records that showed a tendency for heavy rain, if any rain at all fell, 29 or 30 days after the earth passed through a major meteor stream.

The earth's crust was found to be 4,500,000,000 years old.

Discrepancies in calculated ages of rocks found by the lead-uranium method were explained as due to anomalies among the various isotopic ratios.

Six hurricanes caused much destruction during the year; they included two that were particularly devastating in the New England area.

Earthquakes during the year totaled 215 of magnitude six or greater, including a particularly violent one that devastated Orleansville and neighboring villages in Algeria.

Two mountains estimated at 8,000 feet high were found in southern Venezuela just north of the equator, one entirely within Venezuela and the other on the border of that country and Brazil.

International agreement set the nautical mile as 1,852 meters, or 6,076.10333 feet.

ENGINEERING AND TECHNOLOGY

No Scarce Alloys In Heat-Resistant Metal

A highly heat-resistant metal that uses no critically scarce alloying metals was developed; it may replace some stainless steels in jet engines and, some day, may be as common as iron.

A coal-burning gas turbine locomotive was developed that may rival the diesel.

Surplus wheat was puffed into a strong, light, weatherproof, insulating wall board.

Pure, non-rusting iron crystals were achieved in the laboratory.

A plastic was developed that will withstand

temperatures encountered by airplanes flying many times the speed of sound.

Chemicals that bond plastic to glass were developed, thus making plastic cars, boats and airplanes more practical.

A machine that converts sawmill scraps into strong, warpless board was invented; three men can operate it.

Work continued on an electronic aid for the blind; it is planned to use modulated light to detect obstacles, and will emit vibrations to signal a stepdown or other hazard.

A curb-climbing wheelchair for invalids was perfected.

The Army tried out television as a war weapon; cameras on the battlefield showed generals at headquarters how their strategy was progressing.

A television camera tube sensitive to X-rays was developed to help industries make X-ray pictures without film.

Ultrasonic tooth drilling without pain or audible sound was demonstrated upon human patients.

A high-speed tooth drill, driven by a tiny water turbine, was developed.

Titanium carbide, with a high strength at 2,000 degrees Fahrenheit, was developed for jet engines.

Tests using transistors in a new telephone system indicated that several conversations can be carried on at the same time on a single rural telephone line without interfering with each other.

Development of an ultra-high-frequency transistor was a step toward use of these tiny devices to replace a large array of vacuum tubes in radio sets, the transcontinental radio relay system, and submarine telephone and television repeaters.

Objects made of dry ice were tested in a supersonic wind tunnel to shed light on missile-cooling problems and the way meteors burn while plunging through the earth's atmosphere.

Bayonet-fighting tactics were revised for the first time since 1905 to increase survival and to save great amounts of energy.

A doughnut-shaped metal ring smaller than a shirt button was developed as a magnetic amplifier to govern huge machines.

A 110-watt fluorescent tube was developed that gives 35% more light than any previous fluorescent light source.

Plans were completed for an endless belt, linking Lake Erie with the Ohio River 100 miles away, to shuttle iron ore and coal overland.

Electronic computers were harnessed to such tasks as:

Forecasting amount of precipitation in advance of storms.

Routine office record-keeping.

Translating a foreign language into 85% sensible English.

Predicting how and when a flood upstream will hit communities downstream.

"Testing" the performance of jet engines and nuclear reactors while plans were still on drawing boards.

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PATENTS

Patents of the Year

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 year included:

Chemical heating pads for GI battle clothes to keep soldiers warm for 290 hours. Patent 2,680,063.

Electrodes that harden reinforced concrete in 13 minutes, even at near-freezing temperatures. Patent 2,683,916.

High-voltage batteries, printed with polarized layers of metallic ink, to power printed radio circuits. Patent 2,688,649.

A quick, easy and efficient way of recovering uranium oxide from pitch-blende, carnotite, autunite or becquerelite ore. Patent 2,690,376.

A long-range supersonic guided missile having a fuel storage system that does not upset the missile's balance as fuel is used. Patent 2,690,314.

A camera for prospectors that can photograph underground radioactive ores to reveal the extent of the strike. Patent 2,688,095.

A way to give titanium metal a hard outer "skin" comparable to that of case-hardened steel. Patent 2,674,542.

A pulverized, mineral-enriched meat for babies who are allergic to cow's or human milk. Patent 2,673,803.

A tool that bores into mineral ores with a supersonic flame. Patent 2,675,993.

A steel alloy that can withstand temperatures of 1,500 degrees Fahrenheit in jet planes and gas turbines. Patent 2,677,610.

A talking dictionary, on magnetic tape, that also pronounces words through a loudspeaker. Patent 2,677,200.

A wartime radar that picks up only moving

targets such as supply trains or planes, but not fixed objects such as mountains or buildings. Patent 2,678,439 and 2,678,440.

Waterproof leather shoes impregnated with a siloxane to eliminate the need for rubbers. Patent 2,678,893.

A stabilized electronic gunsight that makes it possible for aircraft to shoot down the enemy while executing high-speed maneuvers, even in bumpy weather. Patent 2,660,793.

A cigarette holder with a built-in ash catcher. Patent 2,663,300.

An attachment for power rotary lawn mowers that pulverizes leaves into a mulch for the lawn. Patent 2,663,984.

A sound generator, coupled with oil-bearing sandstone, that sets up standing waves, creates underground heat and raises oil-well production. Patent 2,667,932.

An artificial hand with four three-jointed fingers and an opposed thumb, powerful enough to crush a tin can but controllable enough to hold an egg. Patent 2,669,727.

Soil-treating chemicals that increase absorption of rain, transfer of nutrients to plants and plant resistance to frost. Patent 2,689,173.

An airborne lifeboat packaged like a torpedo for fast, accurate rescue of survivors. Patent 2,686,323.

A combined brief case and overnight bag for two- and three-day business trips. Patent 2,686,580.

A crop cultivator with a guard that enables it to electrocute bugs and weeds without harming corn, cane or cotton. Patent 2,682,729.

A method of oil prospecting by mapping ancient shore lines, now buried, from microfossils found in soil samples. Patent 2,686,108.

A snow-making machine that frees winter-resort businessmen from depending on the weather. Patent 2,676,471.

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PUBLIC HEALTH

Penicillin Success Hints Vaccine Against Syphilis

► POSSIBILITY OF vaccinating against syphilis appears in human volunteer studies reported by Dr. John C. Cutler of the U.S. Public Health Service at the meeting of the American Academy of Dermatology and Syphilology in Chicago.

"First conclusive evidence" that humans develop immunity to syphilis after penicillin treatment for the infection was obtained in the studies with the 62 human volunteers infected by inoculation with syphilis at the New York State Penitentiary, Sing Sing, N. Y.

The results, Dr. Cutler stated, show that "significant immunity develops during the course of human syphilis. This confirms the concepts of immunity established in animal experimentation.

"The 15-month study also developed information suggesting the possibility that a vaccine might be developed to immunize against syphilis," he declared.

"An injection of killed syphilis organisms (germs) apparently protected part of the volunteers who previously had syphilis from being infected a second time when inoculated by live organisms."

The information, Dr. Cutler and associates said, is "far from conclusive but appears to be a step in the right direction toward the search for such a protective agent."

Associated with Dr. Cutler in the study were Drs. Evan Thomas and Lopo de Mello of the New York State Department of Health, Dr. Bernard Kaplan of the New York State Department of Correction, and Drs. Sidney Olansky and Harold Magnusson of the Public Health Service.

Science News Letter, December 18, 1954

VETERINARY MEDICINE

Find Insecticidal Spray To Control Cattle Grubs

► THE FIRST effective insecticidal spray for the eradication of the cattle grub, a highly destructive insect parasite of cattle, was described to the Entomological Society of America meeting in Houston, Tex.

Entomologists A. R. Roth and Gaines W. Eddy of the U. S. Department of Agriculture's Western Research Center, Corvallis, Ore., reported on the results of preliminary tests with the experimental phosphate-type insecticidal spray.

They cautioned livestock men, however, that until further tests are completed, cattle grub control should continue to depend on the standard rotenone, to which the new spray has proved an equal.

In the tests, the scientists found that a 0.5% spray of 3-chloro-4-methylumbelliferone, 0, 0 diethylthiophosphate, simply designated 21/199, applied to the backs of nine grubby cattle, killed all the grubs, 245, in less than a week.

Science News Letter, December 18, 1954