

GENERAL SCIENCE

1958 Science Review

Man reached toward the moon in the closing months of the International Geophysical Year. The Jet Age began for civilian travel; experimental planes promise more speed.

This summary is limited by space to highlights, and credit to investigators and institutions is necessarily omitted. Most of the events are described in detail in the pages of SCIENCE NEWS LETTER for the current year. If you wish to refer to any particular report, you may find it readily through the index. (See SNL, June 28, and also the issue that will appear next week, Dec. 27.) If you want more information about any item in the summary, send 25 cents to help cover answering costs for each item upon which more information is requested.

By SCIENCE SERVICE STAFF

► THE YEAR 1958 saw a continued exploration of space, aviation developments leading to faster flights for war and peace, and a closer approach to a breakthrough in harnessing the hydrogen bomb reaction for peaceful power purposes.

Following the spectacular launchings of earth satellites in the latter part of 1957, the past year brought attempts to reach the vicinity of the moon with space probes, one U. S. shot reaching 71,500 miles from the surface. This pioneering in the field of rocketry foreshadows unmanned travel toward the moon and even to Venus and Mars.

The jet age began in earnest for civilians when both the United States' Pan-American World Airways and British BOAC began transatlantic service with true jets, cutting the travel time between old and new worlds by several hours. Inauguration of jet passenger service across the United States was announced for early 1959, bringing the Atlantic and the Pacific to within three and one-half to four hours travel time.

For both military and civilian future flight, as well as exploration of space, there is significance in the completion this year and the scheduled early testing of the man-carrying experimental rocket plane, the X-15, that will explore the fringes of outer space. A bomber under production that burns chemical fuel, designed to reach 2,200 miles per hour and altitudes of 100,000 feet, gives additional hints of what is to come in the future.

Beneath the sea, atom-powered submarines continued to make records, with the Nautilus making an under the polar ice voyage of 1,830 miles across the top of the world, via the North Pole, and the Skate making a similar trip. The Seawolf remained submerged for 60 days.

Paralleling an East-West political hassle over the suspension of atomic testing, there

was intense rivalry over the development of fusion power, the possible harnessing of the hydrogen bomb reaction to useful work. At the Second United Nations International Conference on the Peaceful Uses of Atomic Energy at Geneva in September the United States showed four actually operating laboratories engaged in fusion research. The first step toward thermonuclear power may have been seen by the visitors there.

The International Geophysical Year (actually an 18-month period) came to a close with the year. The sun produced the largest number of spots in its recorded history. Upon, above and even beneath the crust of the earth there were scientific explorations by scientists of 66 nations.

Antarctica was an area of special attention, with the South Pole colonized and the probability that men will never desert this end of the earth.

A mysterious band of radiation starting about 350 miles above the earth, found by instruments in earth satellites, caused fear that this might stop human venturing into space.

The world cooperation developed by IGY will continue through the years and plans were made to have a new program of international research during 1959.

The science events that attracted wide

public attention may not be those that will be remembered historically in future years.

The basic steps in photosynthesis, the capturing of the sun's energy, seem to have been duplicated outside the living plant for the first time. This may lead to a breakthrough in securing sun energy without the intervention of the green leaf, and if it does this could be as important as atomic power development.

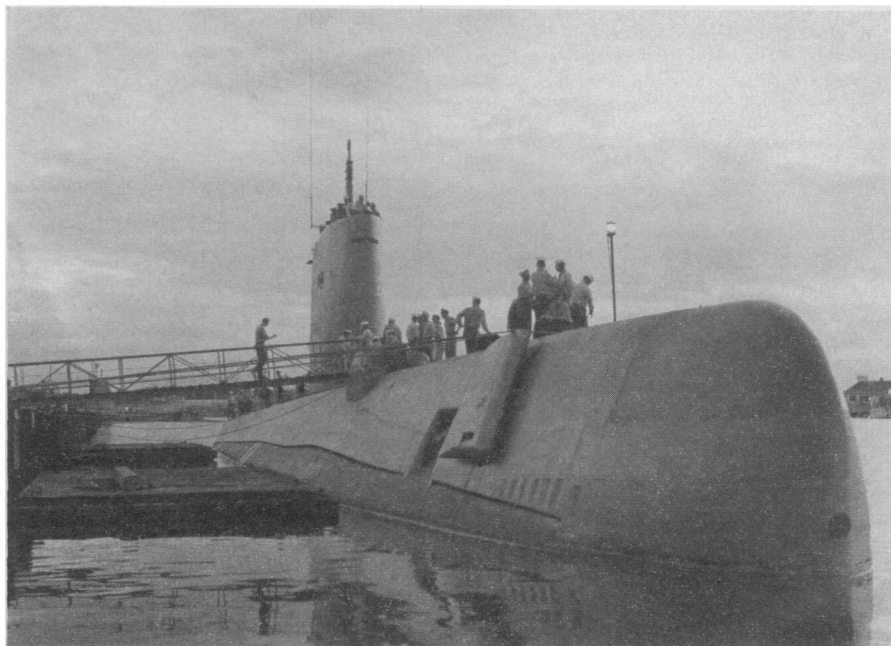
Chemical immaturity of the nervous system was reported a major factor in the mental disease, schizophrenia, and if further research upholds the less amount of neuraminic acid (a brain chemical) in schizophrenics, it may lead to better understanding and possible treatment and prevention.

In medicine considerable apprehension developed over the development and prevalence of disease organisms highly resistant to antibiotics. Outbreaks of such staphylococcal infections in hospitals caused large numbers of deaths, especially among babies.

As civilization advances at an accelerating rate into the future, the past is yielding more of its secrets. A skull and skeleton from a cave in Iraq gave mute evidence that man-like Neanderthaler creatures fought with clubs and rocks 45,000 years ago and that possibly surgery was practiced at that early time, the earliest example of which was the amputation of an atrophied right arm.

In the coal mines of Italy there was found an almost complete skeleton of a 10,000,000-year-old man-like or ape-like animal.

The radiocarbon dating method continued to pin down the chronology of the past. Carbon in an Alabama cave was dated at 7,950 years old and a dugout canoe found in a Netherlands bog was determined to be more than 8,000 years old.



NAUTILUS PREPARES—The atom-powered submarine Nautilus began its 1,830-mile journey across the top of the world from its Pacific port at Pearl Harbor, Hawaii. Its sister ships, the Seawolf and the Skate, also established records in underwater sea voyages.

AERONAUTICS

Completion of Manned Space Ship Announced

Construction was completed on the X-15, research airplane designed to fly above 100 miles in altitude and expected to travel a mile a second.

Two balloonists, Alfred H. Mikesell and Comdr. Malcolm D. Ross, reached an altitude of 40,000 feet in an open gondola, breathing through oxygen masks.

A collapsed, self-inflating balloon was launched at a 50-mile height from a small four-stage rocket and then tracked by radar until it went out of range.

Two balloonists, Comdr. Malcolm Ross and M. Lee Lewis kept their balloon aloft for a total of 34 hours and 29 minutes.

An automatic aileron trim control was developed to help keep small personal planes on course in bad weather.

A navigational "brain" was devised that helps control the flight of high-speed planes through intricate flight patterns.

A push-button navigational system that remembers the way home for helicopter pilots was developed.

An air navigation and flight control method (HIDAN), designed to avoid collisions in the air, was made public.

Progress continued on the production of the chemical-fuel-burning bomber designed to reach 2,200 miles per hour and altitudes approaching 100,000 feet and to make transcontinental runs round-trip without refueling.

It was reported feasible to operate a small plane, continuously circling the earth, on fuel manufactured by itself from trace quantities of atomic oxygen in the atmosphere.

True jet planes were put into commercial passenger transatlantic service when BOAC's Comet IV crossed from New York to London in six hours and 12 minutes, and Pan-American World Airways also began transatlantic service with the Boeing 707.

Inauguration, early in 1959, of transcontinental jet service was announced, cutting travel time to about three and a half or four hours.

A speed of 1,404 miles per hour was reached by Capt. Walter W. Irwin in an Air Force turbojet plane.

An altitude of 91,243 was reached by Maj. Howard C. Johnson in an Air Force turbojet plane.

Two pilots, Jim Heth and Bill Burkhart, kept their light airplane in the air flying at an average of between 80 and 90 miles an hour for 1,200 hours, 16 minutes and 30 seconds.

A new paint was developed for airplanes that has only a small chance of detection by radar.

An electronic device was demonstrated that permits a man on the ground to lead a helicopter around on a 50-foot tether, facilitating use of the helicopter in handling cargo or placing such objects as utility poles or tower sections.

A portable control tower and communications center, mounted on trailers, was developed for Air Force operations.

A midget, low-cost wind tunnel was built to determine airflow up to three times the speed of sound.

(See *Rockets, Missiles and Satellites*)

ANTHROPOLOGY AND ARCHAEOLOGY

Man's Tools Found Dated 8,000 Years

A radiocarbon date of 7,950 years before the present was found for charcoal associated with man's tools in Russel Cave, Jackson County, Ala.

Study of the 45,000-year-old Neanderthal skull and skeleton found in Shanidar Cave, Iraq, revealed evidence of combat with clubs or rocks and what may be the earliest known example of surgery when an atrophied right arm was apparently amputated above the elbow.

Discovery in coal mines of Italy of an almost complete skeleton of a 10,000,000-year-old ape-like or man-like animal known as Oreopithecus gave hope that its place in evolution could be determined.

A prehistoric skyscraper temple, as tall as a modern 20-story office building, was rescued from the engulfing growth of the jungle in Tikal, Guatemala.

The story of man's development from cave-man to city dweller was pieced together from radiocarbon dates of specimens from the soil of the Near East.

Evidence was found that agricultural settlements existed in the Negev desert of southern Israel as much as nine centuries before Christ.

The world's oldest dugout canoe, built over 8,000 years ago and found at a depth of over six feet in a small bog near Pesse, the Netherlands, was dated by the radiocarbon method.

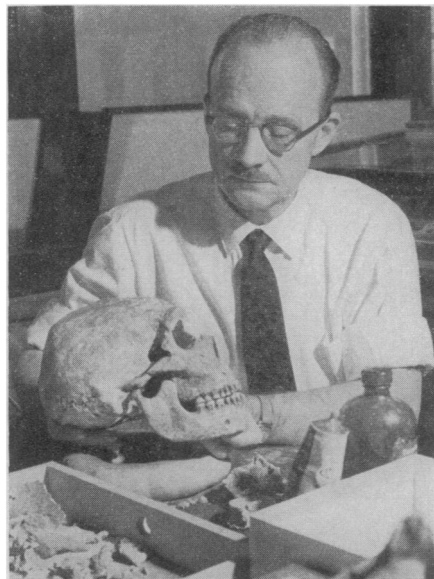
Study of blood groups on the island of Cyprus indicated that the people are more closely related to the Turks and Lebanese of the Asian mainland than they are to the Greeks or the British.

Absence of the Diego blood factor and abnormal hemoglobin E among some of the people of Borneo and low incidence of the Diego factor in an isolated South American tribe were reported, a possible lead to the origin of early Americans.

Comparison of the height of American-born Japanese children living in California with that of children of the same race born in Japan indicates that the small stature of the Japanese is not due to racial differences.

Both accelerated growth and increased final height were found to be characteristic of present generation college students.

Study of the variability of bone growth and aging in different individuals was believed to provide an aid in identification of unknown skeletons.



BATTERED SKULL—Evidence of combat with clubs is revealed in this 45,000-year old skull being examined by Dr. T. Dale Stewart of the Smithsonian Institution.

Enormous chest and lung size, together with an abnormally high blood supply, were found to be factors aiding in the adaptation of Andean Indians to extremely high altitudes.

Identification as vulture bones, of a neglected heap of ancient fragments which had lain for more than half a century in an Italian museum, served to confirm the ancient legend concerning Romulus and Remus and the founding of Rome.

Remains showing twining techniques in the weaving of sea-grass skirts and other objects link the prehistoric Indians of California with much earlier inhabitants of the northern Great Basin of North America.

Digging at Sardis, in Turkey, archaeologists unearthed a pottery fragment incised with an inscription in the little known Lydian tongue.

ASTRONOMY

Masers Increase Radio 'Scope Range

Masers, solid state devices made to oscillate at microwave frequencies, were used for the first time on a radio telescope to increase greatly its sensitivity.

The nucleus, or center, of the Milky Way galaxy was found by radio astronomy observations to be expanding, indicating that neutral hydrogen gas is escaping from the nuclear region.

All galaxies may be the same age but evolving at various rates for reasons not yet understood, such as the proportions of elements of which their stars are composed, was a theory proposed.

Work continued on development of electronic systems for use with telescopes to make them much more sensitive.

Seven areas of the heavens were found by rocket-borne instruments to emit ultraviolet radiation strongly.

The highest number of sunspots in recorded history was seen on the sun's face, with the peak of the current sunspot cycle occurring in March, 1958.

A total of 86 stars definitely are known to have magnetic fields, it was reported, and another 65 stars are suspected of having them.

Two telescopes for the National Astronomical Observatory were under construction.

A 140-foot steerable radio telescope was under construction at the National Radio Astronomy Observatory at Green Bank, W. Va., while at nearby Sugar Grove, W. Va., the U.S. Navy is planning one of unrevealed design that is expected to be more than 400 feet in diameter; Russia reportedly has a 350-foot instrument.

A tie-in between the relative abundance of the various elements and the properties of their nuclei supports the theory that all known chemical elements are built in the hot interiors of stars by eight nuclear processes.

Repeated high resolution solar photographs taken from the stratosphere showed that the sun is dotted with tiny, stable sunspots not connected with solar granulation.

A new kind of noise in the sun's broadcasts at radio wave frequencies was detected; it shows up as an inverted U-shaped figure on the television-like tubes used to record solar radio emission.

The sun was found to have a magnetic halo for storing cosmic rays produced by solar flares.

A computer-linked system for measuring star positions was under development.

A new method of measuring distances to stars was developed.

Use of rockets to study the heavens opened up a new era of rocket astronomy.

The universe was estimated to be from seven

to 13 billion years old, a cosmic age that for the first time is consistent with ages from radioactive dating.

BIOLOGICAL SCIENCES

Chloroplastin Aids Photosynthesis in Lab

Basic steps in photosynthesis were duplicated outside the living plant cell with chloroplastin, a complicated extract of chloroplasts containing chlorophyll and other pigments as well as proteins and fats.

Two embryo chicks that very early received transplanted heads, hatched out and lived, one for 70 days and the other for 55 days.

The chromosome was found to consist of two structurally different strands wound around each other, each of which can replicate to form a new complementary strand.

Negatively charged molecules were found able to substitute for DNA, life-important chemical.

A rust-resistant wheat was produced and researchers in six states started work on breeding a commercially useful wheat from it.

Possible future wheat rusts were produced and wheats resistant to them were created that will be rust resistant for the next 100 years, it is hoped.

Proof that the porpoise uses a kind of "sonar" to avoid collisions and to find food was obtained.

Discovery that the fungus responsible for Dutch elm disease depends for nutrition on two enzymes formed by it, gave hope that an anti-enzyme may be an effective weapon against this fungus.

Certain plants having low mineral intake and growing in extremely acid soils were found to pick up radioactive fallout to an extraordinary degree, a fact that may explain the high concentration of strontium-90 in the bones of upland sheep.

Several species of turtles were found to lack certain proteins found in human and other mammalian as well as amphibian blood, a finding that may throw light on vertebrate evolution.

A safe, effective vaccine produced from killed virus was developed to combat the serious Newcastle disease in chickens.

Vitamin K was found to act as a catalyst in the process of photosynthesis.

A new strain of algae was developed that increases 1,000 times in a day, a possible aid in providing a food supply for space travelers.

Study of color vision defects indicated that some males have two X chromosomes and are therefore genetically female; some sterile males were found to have abnormal color vision.

A hybrid of pod corn with popcorn was produced that has many of the characteristics of the prehistoric ancestor of corn, throwing light on the evolution of the corn plant.

Action was taken to protect a grove of bristlecone pine trees, believed to be the oldest living things, some more than 4,000 years old.

Males are more susceptible to spontaneous leukemia at low altitudes than at heights, studies of mice indicated.

Cockroaches were found to be highly dangerous as carriers of human disease, at least 18 species having been incriminated in the transmission of infectious agents.

A new antibiotic from the soil of Borneo was found not to produce resistance in bacteria after trial on 4,000 persons.

Addition of zinc to the antibiotic bacitracin made it from 100 to 450 times as powerful against bacteria.

Six chemicals (monitrophenols) were found to be effective in killing the predatory sea lamprey without harming game fish.

Study of the movements of fleas tagged with radioactive cesium demonstrated how diseases such as tularemia and plague may spread.

An increase in hours of daylight from eight to 20 caused migratory birds to increase in weight and decrease in energy-giving glycogen.

Geological fault lines and mountain passes were found to be factors influencing the choice of route of migrating birds in western United States.

A large tuna was caught in the Gulf of Alaska, the first time this fish was found so far north.

A new birdseed containing an antibiotic was introduced that gives parakeets excellent protection against psittacosis or parrot fever.

So far as is known, 32 wild whooping cranes came through the annual migrations safely; this includes nine immature birds.

Loss of marshes, swamps and wetlands became critical for survival of waterbirds.

CHEMISTRY AND PHYSICS

Exhibits Show Ways To Tame H-Bomb

Exhibits at the second Atoms-for-Peace Conference in Geneva included operating demonstrations of all of the various methods under investigation for harnessing the hydrogen bomb reaction for peaceful purposes; much information about these attempts was made public for the first time during the year.

Steps toward halting hydrogen bomb tests were taken when scientists from the United States, Russia, England and other countries agreed that a test ban could be monitored; political implementation was under discussion late in the year.

Among suggested peaceful applications of nuclear explosions were using them for earth-moving, excavating harbors, creating large supplies of useful radioactive isotopes and using heat from the explosions to produce power, recovering oil from oil shales and tar sands, restoring depleted water supplies, and discovering new facts about the earth.

An understanding was reached of the so-called weak interactions of nuclear particles, giving scientists a new tool to use as a probe for strong reactions.

The nuclear particle known as a pi meson was observed to break up or decay directly into an electron, an extremely rare occurrence.

Russian scientists reported the first experimental results with the world's largest atom-smasher.

The neutrino was found to spin in a counterclockwise direction when moving away from the observer; it was previously believed to spin in the opposite direction.

Particles unlike those so far found in nature were predicted on the basis of two mathematical models of equations derived from Einstein's general theory of relativity.

The inner part of an atomic nucleus was pictured as more like a hole than a "hard core" in the reaction between protons and anti-protons.

The forces binding atomic nuclei were found to extend into the space surrounding that occupied by nuclear matter.

The tiny electrical field associated with one nucleus was theorized to be sufficient to expand a neighboring nucleus to a larger size, putting its particles into a state more favorable for transfer to other nuclei.

Perfect flow, in which there is no viscosity and therefore no resistance, was verified in a special kind of liquid helium, helium II, that exists only at temperatures near absolute zero.

The smallest unit of energy required to

produce turbulence in rotating liquid helium was detected, providing the first direct evidence of a quantum of circulation.

Promising means of obtaining electricity directly from heat were developed.

The gyromagnetic ratio of the proton, a fundamental constant of physics, was re-determined with great accuracy.

Perfume oils were found to be effective germ killers.

The lifetime of a free neutron was determined as 11.7 minutes with an accuracy within three-tenths of a minute.

The track of a man-made "cascade" particle, the xi meson, was photographed for the first time.

The first U.S. full-scale atomic power station devoted exclusively to civilian needs started supplying electricity for homes and industries in the Pittsburgh area.

The country's second breeder reactor, a nuclear power plant producing more fissionable material than is burned, was under construction.

The world's most precise engraving machine, electronically controlled by an extremely accurate light source, a mercury arc, produced the largest and most nearly perfect diffraction gratings ever made.

An isotope of element 102 was discovered with the heavy ion linear accelerator built by the Atomic Energy Commission.

The world's first liquid helium bubble chamber was built.

A new kind of magnetic writing suitable for electronic computers was discovered; it uses an electron beam.

A new design for high-energy atom smashers, using an azimuthally varying field, was developed.

Very precise measurement of the variation in frequency of radio waves radiated by ammonia molecules during one day provided further confirmation of Einstein's special relativity theory.

The first organic solar battery, made from dyes derived from coal and petroleum, was pressed into wafers and placed into a cell.

Four superconductors containing uranium, two of which contain manganese and iron, were found.

Sun-powered furnaces became available on a mass production basis, and the nation's largest solar furnace, used for laboratory testing of materials, began operation.

Magnesium oxide crystals that normally do not conduct electricity were made conducting for short periods of time by bombardment with high energy electrons.

A method of reducing production costs of deuterium by using bacteria to concentrate the scarce material was found.

The nucleus of living cells may indirectly control protein synthesis, imparting genetic information to the cell cytoplasm, where the synthesis occurs, through ribonucleic acid.

Extremely efficient coagulating agents were developed that improve uranium extraction processes and, in effect, up-grade poor quality ores.

A National Advisory Committee on Radiation was established to develop adequate safeguards against radiation hazards and to advise the U.S. Public Health Service.

Anthracite coal, one of the oldest fossils known, was found to contain the amino acids—aspartic acid, glutamic acid and glycine—suggesting they were the first ones formed and the last to decompose in living organisms.

Extremely small radiation dosages were measured with calcium sulfate-manganese, which gives off light when it is heated.

A fiber was developed that looks and feels like wool, is water repellent and quick drying

like nylon, can be ironed and costs less to produce than any other existing synthetic.

Determining the structure of the protein insulin won the Nobel Prize in Chemistry for Dr. Frederick Sanger of Cambridge University, England.

Three Russian scientists—P. A. Cerenkov, I. Frank and I. Tamm—were awarded the Nobel Prize in Physics for developing a theory explaining the origin of the Cerenkov radiation now used to detect high-speed particles.

ENGINEERING AND TECHNOLOGY

Nuclear Subs Go Under Polar Ice

The nuclear submarine Nautilus made the first undersea voyage across the top of the world under the polar ice cap, a distance of 1,830 miles. The Skate made a similar trip.

The nuclear submarine Seawolf with about 100 persons aboard remained submerged for 60 days.

A ship propeller was developed using hydrofoil cross-sections to take advantage of the condition of super-cavitation to increase ships' speeds.

With the decommissioning of the Wisconsin, the U.S. Navy was without a ship of the battleship class on the seas for the first time since 1895.

A radar system consisting of a number of detectors was developed to detect in all directions simultaneously.

A three-dimensional radar with electronic scanning was developed which simultaneously computes distance, bearing and altitude.

Shortwave radar or radio signals can be used to bounce voice transmissions off the moon, without appreciable loss in quality, to a receiver half-way round the world, it was found.

A mechanical light chopper was devised that produces sharply defined ultrafast pulses of light for experimental and test purposes.

A viewer with which the sky is observed through a rotating Polaroid-covered slit was used to reproduce the pattern of polarized light from a blue sky as seen through an insect's eye.

A finger-sized, ultraviolet-sensitive tube that can simultaneously detect fire, smoke and combustible vapors, was developed.

Invisible rays of infrared light were used to transmit voice messages over considerable distances.

An infrared device was developed to help polar travelers to avoid snow-covered crevasses.

Shortwave radio signals were found to travel 3,180 miles in a single hop, a finding that may require revision in the method used to forecast the best frequencies for long-distance shortwave communications.

A closed-circuit television camera that is more sensitive to small amounts of light than is the human eye was developed; it can transmit pictures of an entire room by the light of a cigarette lighter.

A clear plastic tri-optic lens with high magnification power was announced; it promises to bring vision to the near blind.

An astronomical technique, used with an optical instrument like a miniature telescope, measured precisely the depth of tiny scratches on vital metal parts.

A new kind of X-ray microscope, called the microfluoroscope, with which scientists can watch and measure growth in the living cell, was developed.

A special microscope was developed that uses color television and for illumination short bursts of ultraviolet light; it makes it possible to study living cells without damage to them from the light.

Flexible, light-carrying glass or plastic fibers were found capable of conducting light to illuminate the inside of the stomach and of transmitting the view to physicians for study.

An electronic "brain," the Perceptron, was developed that can perceive, recognize and identify its surroundings without human training or control.

An electronic librarian was developed; the user feeds into the machine a description of his background and work and the machine provides him with a selected list of titles in which he would be interested.

A tiny tape recorder able to store 3,000,000 bits of scientific information was developed.

A high speed automatic printer was developed that can type at the rate of 3,000 words per minute, 20 times faster than normal conversation.

A new kind of kitchen range was developed that cooks in half the usual time with rapidly agitated magnetic eddy currents induced in the steel utensil by moving magnets.

Use of barbed wire in place of plain wire as the energizing electrode resulted in more effective reduction of air pollution.

A battery was developed that can be worn as a vest and kept alive in extremely low temperatures by the heat from the body.

A miniature gas turbine, the 30-pound "Turbo-Mite," capable of delivering either five or ten horsepower, was developed.

A pocket radio that whistles to let you know when somebody is trying to reach you by telephone was tested.

A new concrete building material was developed that weighs only one-third as much as ordinary concrete and can be sawed, chopped and chiseled without losing its strength.

A titanium alloy with aluminum, zirconium, tantalum and columbium was developed that has great strength and can withstand extremely high temperatures over long periods of time.

Haveg compounds, inorganic silicates similar to glass held together with an organic plastic binder, were found to be functional at temperatures up to 12,000 degrees Fahrenheit.

Ultrahigh vacuums were produced by ionic vacuum pumps which do not actually pump but use streams of ions to change the gases in vacuum tubes to solid "fallout."

A new synthetic rubber, nitrile silicone rubber, was announced, that is unharmed by oils and aviation fuels and retains its properties at high jet temperatures and extremely low temperatures.

A nuclear bomb-proof house was designed and is being promoted as hurricane and tornado protection.

Several gases of the Freon family were found to lubricate some metal alloys at temperatures up to 1,200 degrees Fahrenheit.

A British turbo-prop engine that can be installed in present American two-engine airplanes was introduced in this country and promises to make more frequent flights feasible.

A white, fibrous insulating material, potassium titanate, combining light weight with excellent resistance to heat, was developed.

A new electrical insulation material, "Hot Rock," consisting of Fiberglas impregnated with a phosphate material was developed and found to withstand temperatures from 980 to 1,000 degrees Fahrenheit for considerable lengths of time.

GEOPHYSICS

Find Radiation Bands Envelop Earth

An intense band of mysterious radiation enveloping the earth was discovered by instru-

ments carried in earth satellites, and probably consists of electrons but may include protons.

Plans were made to bore a hole a few miles deep in the ocean floor, piercing the Mohorovicic discontinuity, boundary between the earth's mantle and its surface rocks.

The ICSU established a special committee on oceanic research (SCOR) and a special committee on Antarctic research (SCAR) to continue international cooperation in these fields after the end of the IGY.

As recommended by a National Academy of Sciences' meteorology committee, a program for atmospheric sciences was established by the National Science Foundation and a National Institute for Atmospheric Research with a federally supported, five-year budget was proposed by 14 universities.

This year marked a stepped-up program to probe the formation, structure and paths of hurricanes, tornadoes and other severe storms.

Plans for the Weather Bureau's long-range modernization of its aviation weather services included equipping all observing stations with completely automatic equipment.

By simulating in the laboratory the effects of the sun on the earth's atmosphere, the theory was developed that the atmosphere consisted of carbon monoxide, nitrogen, with lesser amounts of hydrogen, water and carbon dioxide when life began.

The horizontal and vertical forces of the earth's magnetic field were successfully measured with a new instrument, the "proton vector magnetometer."

Use of an electronic computer in an objective method greatly increased the accuracy of predicting temperatures five days in the future.

Two weather boards, one to award a seal of approval to reliably presented weather programs on TV and radio and the other to certify consulting meteorologists, were set up by the American Meteorological Society.

The first successful gravity measurements from the open ocean surface were made from submarines and also from surface ships as part of the IGY program.

A new Antarctic mountain range with peaks of 9,000 feet and large ice-free areas, one of which contained a fresh-water lake with plant life, were discovered.

Ice 14,000 feet thick was reported resting on an Antarctic rock bed 8,200 feet below sea level, the thickest ice layer ever recorded.

Comparison by a Russian expedition of the fronts of many glaciers in Antarctica with positions early in the century revealed they had receded at a rate about one-twentieth of that for glaciers in the eastern Alps, although other expeditions in the Antarctic found little or no change.

The roots of the Andes mountains were found to reach down about 33 miles, less than expected from their great heights and confirming measurements showing that the crust under the Rocky Mountains is also shallower than expected.

A living organism was recovered from record ocean depth of 16,200 feet.

The solar atmosphere was found to reach all the way from the sun to the earth and consists largely of hydrogen particles emitted by the sun.

Studies made with rockets confirmed that blackouts of shortwave radio reception are caused by an "extra" layer of ionized air resulting from X-rays emitted by the corona during solar flares, although the D layer remains undisturbed.

The earth's cosmic ray equator was found to depart considerably from the geomagnetic equator.

Certain 100-second waves generated by earthquakes, previously known only in the earth's

crust, were found also in the next lower layer.

Carbon dioxide was found to occur in about the same concentration in the atmosphere over Antarctica as it does in the free atmosphere of the Northern Hemisphere.

The course of one floating ice island station in the Arctic Basin carried observers over what appeared to be a previously unknown underwater mountain chain.

Pronounced changes in the amount of oxygen dissolved in the southern Atlantic Ocean were found to have occurred during the past 30 years, suggesting the deep bottom water rich in food for fish is not being formed as fast now as it was in the past.

Plans were made for an intensive study of the Indian Ocean during 1962-63 by more than 20 ships representing at least as many countries.

The day's length has been increasing about half a thousandth of a second a year since September, 1955, it was found, evidence of irregular variation in the earth's rotation rate.

Lightning flashes produce "whistlers," low frequency audible radio waves, the first successful direct observations showed; other whistlers, too low to be audible, were detected particularly during geomagnetic storms.

A method of long-distance communication using the trail of ionized air left by meteors or satellites was investigated.

Auroras were spotted for the first time in the Southern Hemisphere by use of radar echoes.

Information from the core of a hurricane indicates that, under some circumstances, the release of energy in a moving hurricane is throttled by the intrusion of cooler environmental currents that ventilate the mid-tropospheric layers of the vortex.

Constant-level balloons carrying radio transmitters were placed in hurricanes' eyes as part of a program to test the development of an automatic hurricane-tracking system.

Seismographs for the first time recorded surface waves from nuclear test blasts, although the explosions were 7,000 miles away, and important seismic wave travel time data from nuclear explosions were released.

Earthquake surface waves were used to meas-

ure sedimentary thickness in the vicinity of seismograph stations.

Measurement of crustal thickness over the entire U.S. was made by noting dispersion in phase velocity of earthquake Rayleigh waves.

Six million tons of water are lost each second by the North Atlantic, it was found, and exactly this amount is fed into the North Atlantic from below the equator.

Predictions for rain during the past winter for Los Angeles and the San Francisco area carried a probability statement on an experimental basis.

The earth's atmosphere was estimated to hold more than 28,600,000 tons of suspended dust of cosmic origin below the 60-mile level, about four times as much as previously thought.

Crude petroleum is a colloidal solution with particles measuring only about 150 billionths of an inch, it was demonstrated.

The earth's atmosphere at 240 miles up is 40 times as dense as was previously estimated by one atmosphere model, changes in the orbit of Sputnik I suggested.

A survey of cirrus clouds over Australia indicated meteoric dust sifting down through the atmosphere may be a cause of rain.

Sediment is building up the floor of the Pacific at the rate of about 18 hundredths of an inch every 1,000 years, it was found.

An "explosive" warming of the high atmosphere was discovered through study of weather information radioed earthward from high-flying balloons.

The world's lowest atmospheric temperature, 135.4 degrees below zero Fahrenheit, was recorded 13 miles high above the South Pole on July 16 by U.S. scientists, and the lowest temperature on the ground, -124.1, was recorded on Aug. 9 by the Russians at Sovietskaya, the Antarctic.

Water was reported found 4,400 feet deep under the Ross Ice Shelf.

Observation was made of a man-made auroral display caused by a hydrogen bomb exploded high in the air.

High-speed electronic computers confirmed an 80-year-old theory that the circular wobble

of the earth's poles, called "free nutation," causes small ocean tides.

A swift-flowing river as large in volume as 1,000 Mississippi was found hidden in the depths of the South Pacific Ocean flowing eastward along the equator for at least 3,500 miles.

Europe and America were close to the equator within the last million years, it was concluded from studies of the earth's axis of rotation in ancient times as shown by fossil magnetic rocks and fossil sand dunes.

An automatic weather station was developed to be dropped by parachute in remote or inaccessible areas to transmit weather information by radio for 24 days without attention over a range of 1,000 miles.

Temperature readings taken in 1731 and 1732 at Germantown, Pa., earliest known instrumental ones for North America, were found.

The argon-39 content of a meteorite was measured for the first time.

A mineral that has puzzled scientists since a small quantity was first found 11 years ago in New Hampshire was identified and named strunzite.

Tests showed that sea ice often has more than twice the tensile strength of fresh water ice.

The rotten-egg odor of hydrogen sulfide gas was found to be a reliable clue to uranium deposits.

Colorado oil shale can be converted directly to heating and fuel gas by hydrogasification, laboratory experiments showed.

Weatherision, a method using television to speed distribution of weather information to users, was put in operation.

One of the world's richest fossil fields was explored in Argentina; among other finds it yielded the purple-encrusted bones of reptiles older than the dinosaurs.

The 42-foot-long skeleton of the 100-million-year-old Kronosaurus was reconstructed, the only complete skeleton of what was once the largest flesh-eating reptile in the sea.

Fossil skulls of a dog-like creature, Daphoenus, showed that some 35,000,000 years ago dogs and cats were less widely separated than today.

Study of the skeletons of small dog-size reptiles indicated that they may be a transition stage between mammals and reptiles.

MEDICAL SCIENCES

Staphylococcus Infections Increase, Cause Deaths

Outbreaks of staphylococcal infections in hospitals caused large numbers of deaths, especially among babies, and new strains of these bacteria were found that are highly resistant to many antibiotics.

Abandonment of mass chest X-ray programs for tuberculosis screening in low risk population groups was recommended by the U.S. Public Health Service, and substitution of the skin test in compulsory programs in schools.

1958 would have been a peak year for paralytic polio had it not been for the Salk vaccine.

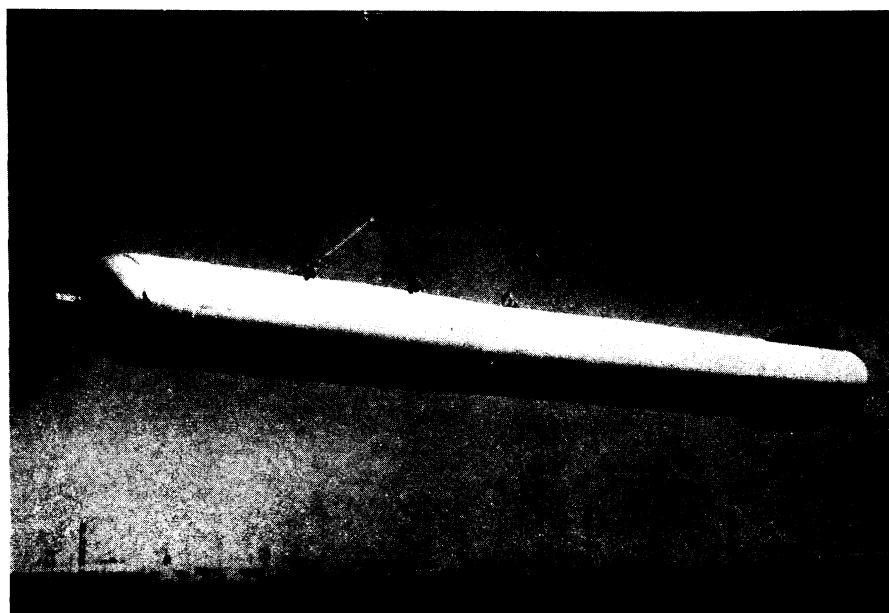
The nation had no major influenza outbreaks this year. Epidemics were mild and localized.

A new method of "progressive care" has been adopted by a few hospitals, which provides that patients are moved from intensive care, to intermediate care, to self-service care as their condition improves.

New antibiotics:

Mycobacillin, reported from India as effective against many types of fungus infections.

Kanamycin, very active against clinical strains of staphylococcus resistant to the commonly used antibiotics and promising to be an anti-tuberculosis drug.



BEACON PACKAGE—The 400-pound hurricane beacon package is being loaded into the bomb bay of the B-50 aircraft of the Weather Bureau's National Hurricane Research Project. The first time it was launched into the eye of a hurricane was on Sept. 24, in Hurricane Helene, testing the development of an automatic hurricane-tracking system.

Griseofulvin, effective against ringworm and other fungus infections of the skin.

New Drugs:

Inexpensive sulfa drug against common infectious organisms.

B663, against tuberculosis, found effective in tests on mice.

Aristocort triamcinolone, and a new synthetic steroid, hexadecadrol, for arthritis.

Sleeping drug, glutethimide, reported non-habit forming and not creating a "hangover."

Dithiazanine, against five different types of human worm infections.

A local antiseptic, Betadine, against gum infections caused by dental hypodermics.

Methoxsalen, for producing a sun tan without painful burning.

An enzyme called fibrinolysin, derived from human blood, found extremely effective in dissolving blood clots.

A live virus polio vaccine pill reported highly effective among people of the Belgian Congo.

Diethylcarbamazine, which destroys the parasite in the bloodstream, and control of mosquitoes offered hope of controlling filariasis.

New drugs to be taken by mouth: For diabetics, chlorpropamide, or Diabinese.

Unnamed drug against the sandfly parasite responsible for the diseases kalar-azar and oriental sore.

Evidence was reported indicating that radiation damage does not necessarily appear within a definite period after exposure and that there is no such thing as maximum permissible dose of radiation.

It was found "virtually impossible" to remove radioactive strontium-90 from the bones of living persons once it has lodged there.

Evidence was found that the incidence of leukemia and other malignant diseases in early childhood may be increased by the diagnostic use of pelvic X-rays late in pregnancy.

Detection of cancer of the uterus was made simpler and quicker by an electronic scanning device.

An extremely sensitive method of detecting radiation sickness in its earliest stages was reported from Russia.

Small doses of radiation were found to slow down aging in dogs.

A substance in protoplasm was found to save 96% of amoeba from death after exposure to lethal doses of fission neutrons.

The infectious agents that cause the common cold are able to stimulate the body to produce antibodies that fight the cold, it was reported, a finding that may lead to developing an immunizing vaccine.

A bacterium in the intestinal tract of the honey-guide was found to aid that bird in digesting bees' wax; it was found to have a "degree of interference" with the waxy coating on the tuberculosis bacterium.

Animal tests on Provera, a substitute for the hormone progesterone that prevents miscarriage or premature birth, suggested that it might also prove useful as an oral contraceptive.

An amine, 3-methoxy norepinephrine, was discovered and was reported to possibly play an important role in the control of blood pressure and heart function.

A penicillin antibody in the blood of some individuals was detected for the first time.

Discovery was reported of the first hormone ever isolated from the pineal gland and it was named Melatonin.

Discovery was reported of a compound, coenzyme Q, that plays a key role in the living cell's manufacture of proteins.

The anticoagulant drug warfarin sodium was found also to aid asthma by dilating the bronchial tubes.

Addition of small amounts of carbon dioxide to undifferentiated frog embryo cells was found

to cause the cells to form nervous tissue the day after fertilization.

Fluothane, a non-explosive anesthetic, was introduced and used successfully in many kinds of surgery.

The single chemical agent that causes hay fever was extracted from ragweed pollen and identified as Trifidin A.

A chemical substance was isolated from human saliva that inhibits or destroys bacteria commonly associated with tooth decay.

A syphilis test called RPCF, more specific than a Wassermann and simpler than the TPI, was developed and found to have considerable promise.

A fast inexpensive screening test for syphilis was reported that requires only a drop of blood.

A combination of PAD and the closely related PAM protected mice against the lethal action of the nerve gas sarin.

Trial of four-in-one immunization shot offering protection against polio, whooping cough, diphtheria and tetanus showed it to be successful.

Isolation of a virus that may lead to development of a vaccine against trachoma was reported from Communist China.

Results of treatment with the drug Orinase showed it to be highly successful with only one type of diabetes.

Histoplasmosis, until recently considered rare and usually fatal, was found to affect more than one-third of the young adults in some areas of 22 of the United States.

A previously unknown type of microorganism, closely resembling that of tuberculosis, was isolated from a group of children thought to be afflicted with scrofula and 25 adults being treated for tuberculosis of the lungs.

Sterility can be caused by incompatibility of the blood groups of a husband and wife, it was found.

A new disease of the lung called alveolar proteinosis, marked by stoppage of the air sacs of the lungs, was reported.

A shortage of physicians is inevitable during the next 12 years even if large funds for medical education and research are provided now, a report to the Secretary of Health, Education and Welfare showed.

Polio shots during pregnancy were found to protect the unborn child as long as three months after birth.

The common cold can be prevented, it was reported, by weekly injections of a vaccine prepared from the individual's own nose and throat bacteria.

Scientists found men with 47 and 46 chromosomes as well as the formerly accepted 48.

A special well-balanced diet was reported to slow the deterioration of vision in nearsighted children while some actually improved.

Death from severe alcohol intoxication was found to be sometimes due to circulatory failure and not always to respiratory failure as previously thought.

Man can stand excessive heat such as in a space ship for a longer period if he is pre-cooled by immersion in a tank of cold water, it was found.

How long an animal can live on a vitamin-A-deficient diet before he begins to show signs of night blindness was found to depend on the amount of vitamin A stored in the individual liver; it takes anywhere from a few months to years for humans to develop symptoms of night blindness.

A "hospital for tomorrow" was designed to combine modern concepts in hospital care with protection in case of catastrophe; its functioning nucleus is underground.

Discovery and identification were reported of two new viruses believed responsible for many

of the respiratory illnesses suffered by children.

Different internal arrangements of a virus's nucleic acid components can make the same virus cause different infections.

A highly effective method for detecting cancer of the colon by examining washings after a salt solution enema, was reported.

A newborn baby was saved from hydrocephalus by surgically channeling the excess water on the brain into a reservoir made from a segment of the small intestine.

An abnormality of the cerebrospinal fluid—excessive amounts of protease and vasodilator polypeptides—was linked with diseases of the central nervous system.

The carbohydrates associated with gamma globulin were found to be increased in the spinal fluid of multiple sclerosis patients, a finding that may lead to early diagnosis of this disease.

The gonococcus, organism that causes gonorrhea, is becoming immune to penicillin, it was observed.

The structure of a bacterium—whether it is a smooth or rough form—was found to make a difference in its chances of being ingested and destroyed by white blood cells.

Blood samples taken from Americans with rheumatoid arthritis revealed a rheumatoid factor composed of several closely related proteins.

Heart murmurs that have previously gone unnoticed were picked up by a device that records tiny vibrations of the chest wall rather than the actual sounds of the beating heart.

Cancer-damaged esophagus was repaired by patching with the large artery of the heart.

A new cause, hormone imbalance, was found for polyarteritis nodosa, a usually fatal disease that creates dangerous lumps or nodules inside artery walls.

A seven-year-old boy survived the first heart operation that re-routes blood past the right side of the heart. His blood now travels directly to the lungs to pick up fresh oxygen without the normal push from the right heart.

A new surgical technique for treatment of angina pectoris involved complete removal of the sensory and motor pathways from and to the heart.

Just how thrombin acts on fibrinogen to clot blood was revealed to be the rearranging of the electric charges on the bonds of each molecule so that fibrinogen molecules clump together.

The barks of certain Australian trees were found to contain blood pressure reducers that may prove more effective than reserpine.

Blood pressure within human hearts was measured very accurately with a tiny pressure pick-up device threaded through arteries directly into the heart.

An isolated animal heart was kept alive for 18 hours outside the body in order to study the fibrillation of the heart muscle.

Human plasmin, an enzyme in blood plasma, successfully dissolved blood clots in the blocked arteries.

Hemoglobin, oxygen-carrying protein in red blood cells, was successfully manufactured in a test tube.

A new chemical, Malignolipin, was found only in malignant tumors and never in normal tissue.

A new antibiotic, Mitomycin C, cured a virus-caused leukemia in mice.

A new speedy test for mild cases of diabetes was reported; it involved measurement of the decline of blood sugar after injection of sodium tolbutamide.

Injection of radioactive vitamin B-12 and tracing it to find out whether the vitamin is absorbed by the body proved useful in distinguishing between pernicious anemia and other anemias.

Three-dimension motion pictures of the activity of the heart became possible.

The Nobel Prize in Medicine was awarded to three men—Drs. George Wells Beadle, California Institute of Technology, Edward Lawrie Tatum, Rockefeller Institute, and Joshua Lederberg, University of Wisconsin School of Medicine; they have been active in studying the relation of chemistry and radiation to genetics.

PATENTS

Improved Piston Engines, Materials Patented

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 include:

A free piston engine with an improved method of running the pistons out of phase so that the gas charge to the turbine is more uniform. Patent 2,839,911.

A ceramic turbine exerting compression instead of tensile stresses so that the ceramic blades can withstand the stresses of a turbo-jet engine as well as the fierce temperatures. Patent 2,855,179.

A double pneumatic engine which provides greater efficiency, requires less maintenance, is quieter and takes a good share of the shock away from the operator. Patent 2,821,962.

A device for reversing the thrust on jet aircraft, thus serving as a brake. Patent 2,858,669.

A high-speed auto racing car with a safety device for counteracting the effect of centrifugal force on curves. Patent 2,816,615.

A Y-shaped steering device for automobiles that may replace the conventional steering wheel. Patent 2,827,801.

An automatic warning system for superhighways that posts a reduced speed limit for any of a number of dangerous conditions and also informs the driver why the limit is reduced. Patent 2,849,701.

A safety braking system using a pair of hydraulic pressure cylinders, one for the front brakes and the other for the rear brakes, either of which can stop the vehicle. Patent 2,857,584.

Fire fighting equipment for burning airplanes which uses a sharp-ended boom to pierce the airplane and force in fire extinguishing liquid. Patent 2,857,005.

A fire and explosion protection system for airplane fuel tanks which senses the arrival of a piercing object and automatically releases a combustion-inhibiting substance to cover the fuel and tank. Patent 2,815,819.

A self-inflating girdle to protect airplane pilots from blacking out in steep dives. Patent 2,820,452.

A thermal windshield wiper, made of electricity conducting glass coated with a thin transparent conducting film of tin oxide to keep airplane windshields free of ice and snow. Patent 2,833,902.

A high-speed balloon with an air-filled skirt secured to the spherical section of the balloon to make it an inverted tear-drop shape. Patent 2,844,336.

A pork-barrel-shaped aircraft surrounded by a ring-shaped wing and controlled by a series of flaps so that it can take off and land vertically. Patent 2,846,164.

A missile and rocket tracking system by means of a continuous wave transmitter and a number of spaced receiving stations on the ground. Patent 2,817,081.

Bullets embedded in plastic carriers that can

reach velocities in excess of 5,000 feet per second. Patent 2,820,412.

Use of infrared sensing devices for guiding bombs or missiles to a target. Patent 2,825,021.

A rapid-fire cannon like the Gatling Gun designed specifically for supersonic jet aircraft. Patent 2,849,921.

An air-cooled nuclear reactor. Patent 2,836,554.

A process for separating plutonium from uranium, important to the nation's atomic program. Patent 2,851,333.

A method for preserving foods through the control of ionization. Patent 2,851,366.

A vaccinator consisting of a small metal plate holding five small needles and a breakable capsule containing the vaccine, all mounted on a first-aid bandage. Patent 2,817,336.

Use of electron beams to sterilize food and medicine on an assembly line basis. Patent 2,824,969.

A mechanical heart massager to keep a patient alive during heart surgery. Patent 2,826,193.

Antibiotic textiles that can be washed and ironed without loss of the antibiotic. Patent 2,830,011.

A no-kink nylon artery for use to replace tired, clogged or diseased human arteries. Patent 2,836,181.

A new variety of seedless purple grape, thinner and more tender than the Concord grape. Plant Patent 1,681.

An electrolytic method for reclaiming poor soils by removing harmful salts from alkali soils and by breaking up the hardpan. Patent 2,831,804.

The use of 2,4-D as an insecticide and weed-killer as well as a fungicide. Patent 2,839,444.

A method of producing bigger and better plants by pretreating seeds with gibberellic acid before planting in soilless gardens. Patent 2,849,835.

A process for shrinkproofing animal fibers, especially wool, using epoxy resins and polyalkyleneimines. Patent 2,817,602.

An electronic music synthesizer that is capable of producing any musical tones without musicians. Patent 2,855,816.

An electronic camera capable of taking pictures by infrared or X-rays as well as visible light. Patent 2,834,889.

Production of electricity from heat by reversing the process of resistance heating similar to that used in the kitchen stove. Patent 2,857,446.

A boat with retractable wheels providing an improved means for following a towing car. Patent 2,852,461.

A metal clamp and clasper to tag newborn babies for safer identification. Patent 2,813,269.

A gas-filled diving decoy for duck hunters. Patent 2,814,898.

Use of ultrasonics to produce a better brew of beer. Patent 2,816,031.

A simple, inexpensive camera for taking and developing 35mm. transparencies can be used for viewing the slides. Patent 2,819,662.

An escalator that can move around turns up to a half-circle and follow a curved path. Patent 2,823,785.

A miniature sport submarine of plastic-impregnated glass cloth, propelled by pedals. Patent 2,823,636.

A reflective heat-insulating coating for cows to keep the animals cool in warm climates. Patent 2,826,169.

An automatic food-dispensing apparatus for drive-ins. Patent 2,827,130.

A long range projector that can be used to project advertising or other images on clouds, smog and mountains. Patent 2,827,831.

A counterfeit bill detector for use in vending machines. Patent 2,827,822.

Use of tailor-bred bacteria to extract a va-

riety of metals from acid mine water. Patent 2,829,964.

A lightweight concrete, using the sugar cane residue bagasse instead of stone as the aggregate. Patent 2,837,435.

An electroluminescent lamp that can be made in practically any convenient size or shape and not requiring any bulb or hermetic sealing. Patent 2,838,715.

A mechanical teacher that automatically instructs children in elementary arithmetic, spelling and other subjects. Patent 2,846,779.

PSYCHIATRY AND PSYCHOLOGY

Spinal Cord Fluid Related to Mental Ill

Evidence that schizophrenia may be the result of a chemical immaturity of the nervous system was seen in the finding that adult schizophrenics have considerably less neuraminic acid in the spinal cord fluid.

The anti-tuberculosis drug iproniazid was found effective as an anti-depression drug to prevent suicide.

The number of suicides in the United States reached an all-time low of less than ten people per 100,000, it was announced.

Study of 140 suicides in New Hampshire showed that half had given warning either by threat or attempt before the fatal act.

A follow-up study of mental patients who had undergone the operation of topectomy showed marked intellectual loss on eight out of the 14 psychological measures used; the exact site of the operation was found to be important to the amount of impairment.

Evidence was found that capacity for learning may be governed by the balance in the brain of two chemicals, cholinesterase and acetylcholine.

Some mentally retarded children can be helped by elimination of one of the amino acids in the diet or by psychiatric treatment of themselves and their parents, and other mental defects can be prevented by special management before birth, it was found.

More than two-thirds of the patients admitted to the medical service of a large city hospital were found also to have a psychiatric illness.

Hallucinations were found to start when sensory signals to the brain fall below a certain minimum, accounting for the visions seen in the dreams of sleep, in highway hypnosis and in brainwashing.

Injection of very hot water into the frontal lobes of the brain was used as a new form of lobotomy.

Production of corticosteroids by the adrenal gland of schizophrenic patients was found to be not related to stress as it is in normal persons.

Improvement of the diet of mental patients by elimination of greatly disliked foods or by addition of the food element L-Glutavite brought improvement to elderly and other patients.

Aged mental patients were found to improve when "adopted" by a specific nurse or nurses.

Signs of mental disturbance were observed in babies as young as six weeks.

Tranquilizers, taken to treat high blood pressure, have triggered depressions that have sent some patients to the mental hospital, it was found.

The tranquilizer reserpine given to cats was found to cause loss of learning how to escape an electric shock although it did not prevent perception of the warning or the anxiety associated with it.

It was found possible to determine objectively just how soundly a person is sleeping at any time during the night by a continuous recording of his brain waves.

Guinea pigs learned to have asthma attacks even when the substance to which they are allergic is not present; they could also "forget" it.

The love of a baby for his mother was found in work with monkeys to be based more on the comfort of contact than on the fact that the mother gives him food.

Continuous mothering is not essential for a child to develop a healthy relationship with his parents, research in the Kibbutzim of Israel showed.

An infant born without a forebrain lived for three months and behaved much as would any normal newborn.

Study of a girl who is colorblind in only one eye added to knowledge of certain abnormal perceptions of color.

An indirect way was found of detecting the visual pigments in the intact eye of a living seeing human individual by shining different colored lights into the eye.

A temporary loss, or blank-out of vision, was found to affect travelers in Arctic snow on an overcast day, in fog or under an unbroken sky.

The most dominant individual in a flock of hens can be trained to be the most submissive and the most henpecked individual can learn to dominate, it was found.

Mynah birds were found able to learn to use words in a meaningful way to name objects.

Rats were found able to learn to be sensitive to the pain of other rats.

The rhythm of alternate feeding and ejection of the European lugworm was found to be guided by a "physiological alarm clock," and not by the biological needs of the worm; the rhythm is believed related to other inherent rhythms such as heartbeat in man.

The tail of a marine flatworm can retain conditioning even when cut off from the head end, indicating that learning does not take place exclusively in the head.

ROCKETS, MISSILES AND SATELLITES

U.S. Space Probe Reaches Greatest Height

Pioneer, man's first space probe and one of five planned shots, reached a maximum velocity of more than 23,000 miles per hour and a distance of 71,500 miles from the earth's surface, then burned up in the earth's atmosphere.

Pioneer III reached 63,000 miles above the earth's surface and had a maximum speed of 23,900 miles per hour.

An international committee on space research (COSPAR) was established by the International Council of Scientific Unions to plan scientific studies made with rockets, satellites, and space, lunar and planetary probes.

The National Aeronautics and Space Administration was established, taking over personnel, facilities and research activities from its predecessor, the 43-year-old National Advisory Committee for Aeronautics.

Spores were suggested as the original space travelers since it was found that they can live in the virtually airless atmosphere found high above the earth.

An international code was framed to keep damage at a minimum from a scientific point of view when landing objects on the moon or planets.

Plans were drawn for a satellite to orbit at a height of 400 miles in a path from pole to pole for studying the universe, and particularly the sun.

A science space board was formed by the National Academy of Sciences and the National Research Council to survey problems, opportunities and implications of man's advance into space.

A full-scale five-stage rocket was test fired and reached a speed exceeding Mach number 16 (10,516 mph) and an altitude of several hundred miles.

Atomic tests in the Pacific included some aimed at perfecting a missile-borne warhead that can be exploded in space in the path of incoming missiles.

Study of radio measurements of the Vanguard and Explorer satellites showed the ratio of the earth's flattening at the poles is 1 to 298.38.

A small rocket-powered device, called the Buck Rogers, was tested and permitted a soldier to run for several seconds at 35 miles per hour without tiring and to leap 20 to 30 feet.

"Ghost satellite" radio signals from Russian sputniks were received at stations 180 degrees away on the earth from the satellite's true position.

Radio signals from U. S. satellites were found to scintillate in the same way that radio sources twinkle.

Glide and skip rockets were under study as well as the intercontinental ballistic missile.

Solar cells, fuel cells and thermoelectric generators were investigated as power sources for instruments in guided missiles.

Nuclear batteries were found to be a promising power source for electrical and electronic systems in satellites and space vehicles.

Interplanetary ion-drive rocket ships powered at fantastic speeds by the tiny thrust of streams of electrically charged matter were shown to be practical.

The chemical energy stored in the earth's high atmosphere might be used to propel a satellite indefinitely at an altitude of 60 miles, a preliminary study of such a "fuelless" satellite showed.

The future orbit of an earth satellite can be predicted quite accurately from the change in frequency of its radio signals received at a single station during a single pass of the object, it was found.

Interplanetary dust that would bombard the skin of an earth satellite or space ship is much thicker than has previously been thought, possibly as dense as 200,000 specks each cubic mile, it was reported.

A pilot of a rocket vehicle re-entering the earth's atmosphere after having been weightless in space flight will have less tolerance to acceleration and less rapid recovery from space effect than in ordinary flight conditions of constant gravity, tests showed.

A 12-foot balloon to be placed in an earth-circling orbit from an Explorer satellite was successfully test-launched to a height of 50 miles.

A space age simulator was built that duplicated in the laboratory the tremendous heats and stresses any vehicle re-entering the earth's atmosphere at great speeds would have to withstand.

An apparent relationship was found between solar flares and changes in the rate of decrease of the rotation period of Sputnik II.

Adequate temperature control for sensitive instruments inside a satellite was obtained by coating the vehicle with strips of heat-radiating chemical.

A photoelectric method was devised for making precise observations of the path artificial earth satellites take as they circle the earth.

Use of the "pinch effect," employed in experiments for controlling thermonuclear fusion, to propel an unmanned vehicle on a one-way interplanetary flight was tested.

Aluminum squeeze tubes were tested as a means of feeding pilots dressed in space suits.

Science News Letter, December 20, 1958



X-15 COMPLETED—The experimental airplane, the X-15, designed to fly at an altitude of more than 100 miles and at a speed of a mile a second, may be the first ship to carry man into space. Construction was completed in 1958 and tests are being conducted.

PUBLIC HEALTH

Alaskan Health Record Improved Over Ten Years

► ALASKA is still a pioneer land in one respect; accidents ranked first among the causes of death in 1957, accounting for nearly one-fifth of all deaths.

In other ways, Alaska's health record has improved measurably in the last ten years, statisticians of the Metropolitan Life Insurance Company, New York, reported. The mortality rate in the white population fell from 8.7 to 4.6 per 1,000, while the rate for non-whites decreased from 15.2 to 10.7 per 1,000.

Control of tuberculosis, a major health problem in Alaska, has been "particularly impressive." Between 1947 and 1957 the TB death rate fell more than 80%. Infant mortality is also declining.

Many serious health problems await solution for the non-white population, however. A five-year study shows the age-adjusted death rate for non-whites is 18.0 per 1,000, compared with 10.3 for the white population.

Science News Letter, December 20, 1958