

REVIEW OF THE YEAR

Defense Research Marks 1940

Electron Microscope Opens New World; Brightest Comet Since 1910; Vaccines for Influenza, Measles

This summary of the year's happenings in the world of science is limited by space to just the highlights. Most of the events are described in detail in the pages of the 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 29 and also the issue which will appear next week, December 28.)

By SCIENCE SERVICE STAFF

WAR and defense effort accelerated applied research in the physical sciences and medicine and slowed searchings for knowledge in many other fields during 1940.

In the realms of the minute, the electron microscope peered into germs and saw molecules of matter, the search for atomic power from uranium progressed shrouded in secrecy for defense reasons. In the air, faster and more deadly airplanes, a successful helicopter, and more aeronautical research facilities. In the skies, the brightest comet since 1910, and a triple star. In the animal world, a

"new" large mammal, the kouprey, first of major size since the okapi. For our health, vaccines against influenza and measles, continued chemical warfare against disease. For sick minds, successful therapy through electric shocks.

These were some of the highlights of science in 1940.

Science Service's annual survey of science shows these outstanding accomplishments and events:

AERONAUTICS

New Plane Types Built; Production Speeded Up

A successful helicopter made in the United States and an autogiro capable of vertical take-off were demonstrated.

A new interceptor fighter plane, capable of ascent at a speed of more than a vertical mile a minute, was demonstrated.

The Allison engine, America's principal contribution to the art of liquid cooled aircraft engines, was perfected to the point of going

into quantity production in the General Motor's Indianapolis plant.

Military airplanes attained speeds exceeding 400 miles per hour.

Air-cooled airplane engines developing more than 2,000 horsepower were developed.

The world's largest land passenger airplanes, with a daytime passenger capacity of 42 passengers, weighing 25 tons and powered with four engines, went into production.

Exhaust driven turbo superchargers permitted airplanes to fly faster and higher.

Air transport planes began to carry passengers in pressurized cabins above the weather.

The keel was laid for the world's largest flying boat, destined for the U. S. Navy.

Federal control of aviation was changed with the abolition of the Civil Aeronautics Authority and the creation of the Civil Aeronautics Board and the Civil Aeronautics Administration.

Military air service in the United States was aided when an air officer was made deputy Chief of Staff and a Lieutenant-General was placed in charge of the G. H. Q. Air Force.

Experiments were carried out which indicate that airplanes can be made successfully from plastics.

New aviation fuels that increase safety by reducing greatly the fire hazard, were developed experimentally.

Motion pictures were taken at 40,000 frames per second using an NACA high-speed camera in the study of knocking combustion in aircraft engines.

An elaborate government program to train civilians as pilots, especially among college students, was started.

Trans-Atlantic aviation was subjected to unusually heavy traffic because of the disruption of steamer service on account of the war.

Air service from the United States to New Zealand and Australia was inaugurated.

New air routes into China kept that nation in touch with the outside world despite the Japanese invasion.

An airplane was for the first time certified by the government as being stall-proof and spin-proof.

Building of English type airplane engines was started in the United States.

A program to build large numbers of airplanes for U. S. defense was started.

New laboratories for aviation research were begun by the National Advisory Committee for Aeronautics at Moffett Field, Calif., and at Cleveland, Ohio.

Engineers developed a new ultra-high frequency radio compass system for airplanes, which sends out a beam that sweeps around the horizon sixty times a second.

ANTHROPOLOGY AND ARCHAEOLOGY

Navajo Indian Language Put Into Written Form

Navajo Indians saw their language put into alphabetic writing for the first time.



AIRACUDA

A new Army plane with the emphasis on speed and fire-power. It carries a crew of six and has a cannon in the nose of each engine nacelle. Machine gun nests are concealed on top of and beneath the fuselage. The plane flies at 300 miles per hour and has a range of 2,500 miles. It is a new design by the Bell Aircraft Corp.



GOOD HUNTING

You seldom see such a hunter's dream as this concentration of canvasbacks on Lake Merritt in California, but protective regulations are bringing an increase in these highly-prized ducks. The photograph is an official one of the U. S. Fish and Wildlife Service.

New equipment made it possible to play safely thousands of frail cylinder records on which scientists have preserved folk music and primitive songs.

Turning a crank, an archaeologist of today buried the Time Capsule at the New York World's Fair, packed with exhibits and records of our civilization for the archaeologists of 6939 A. D.

War in Europe endangered such irreplaceable antiquities as the Rosetta Stone (London), the Elgin Marbles (London), bust of Queen Neferiti (Berlin), and temples and monuments in Athens and many other cities.

Discovery in Java of a fourth skull of Pithecanthropus provided scientists with the first chance to study a grown male skull of this ancient pre-human genus.

The undamaged silver coffin and golden ornaments of Pharaoh Psousennes I found in the Egyptian Delta were pronounced in some respects as important a find as the Tutankhamen tomb.

The sanctuary at Samothrace where the famous "Winged Victory" once stood was excavated, shedding new light on Greek mystery religions.

Pronounced the world's oldest "steel" weapon, a battle axe found in Syria shows skill of munition makers of 1500 B. C.

The American scientific achievement of surveying from the air Iran's ruined cities and unexplored mounds will greatly aid future archaeological digging there, the first published report of the survey showed.

Better understanding of King Solomon's empire-building and trade expansion ventures was gained, as an American expedition completed excavation of Ezion-geber, Solomon's combined seaport, factory town, and naval base by the Red Sea.

Measurements of more than 2,000 native blacks in the Solomon Islands provided valuable aid for solving the mystery of Negro past in Melanesia.

A world-wide survey of Polynesian culture relics in museums was brought almost to completion, despite conditions abroad.

The 1940 Census showed that population of continental United States has increased 7.2% in 10 years to a total of 131,669,275; while preliminary figures based on the census returns give the entire United States with its territories and possessions a population of 150,621,720.

The first meeting of governments to confer on economic and social problems of 30,000,000 Indians in the Americas was held in Mexico.

The Coronado Cuarto-Centennial celebrated in the Southwest stimulated historic and archaeological study of the Spaniard's route.

Explorations at Sandia Cave, New Mexico, added to knowledge of Sandia Man, recently found aboriginal American so ancient that his campfire refuse lies beneath that of Folsom hunters.

Three successive eras of Folsom Man's career in early America were traced by finding a stratified corner of the Lindenmeier site in Colorado.

Three types of prehistoric American culture, dated by geological evidence at about 6000 B. C., 2000 B. C., and the dawn of the Christian era, were reported at a lake bed of southern Oregon.

Excavating the oldest town yet found in Arctic Alaska, an expedition traced well planned streets with more than 600 homes, and unearthed burials stored with art and cultural objects perhaps 2,000 or 3,000 years old.

An old Panama graveyard revealed the burial of an Indian official in gold regalia and surrounded by sacrificed slaves or captives.

Assembling massed bones of Chief Powhatan's buried tribesmen provided evidence for a better picture of the typical Virginia Indian encountered by colonists.

Appearance of the famous Hopewell Mound Builders of the Ohio Valley became less mysterious, as scientists, examining skulls of these Indians, found them a long-headed race, with a

custom of artificially narrowing the forehead in childhood.

Five colossal stone heads and other remarkable art objects unearthed in Tabasco Province, Mexico, added to knowledge of the Olmec Indian civilization which preceded the Toltecs.

ASTRONOMY

Naked Eye Comet Is Year's Most Spectacular Event

Five comets were discovered, four were new ones, one the return of a periodic comet found in earlier years: Kulin, periodic Whipple, Cunningham, which has attained naked eye visibility as the brightest comet since 1910, a new Whipple and Okabayasi.

By means of photographic observations of the effect it produced on two visible stars, an invisible companion was discovered to the double star system Zeta Aquarii.

The probable relationship between Encke's comet and meteors of the Taurid shower, which appear in the autumn, was demonstrated; both the meteors and the comet are apparently the remains of a larger comet of the past.

Taking into consideration new measures of their distances, the diameters of the largest known stars were recalculated, giving first place to Ras Algethi, in the constellation of Hercules, with 690,000 miles, and demoting Antares, formerly supposed to be largest, to fourth place.

Four exploding stars, of the type known as "super-novae," were discovered in distant star systems.

Fifteen "white dwarfs," stars of extreme density, weighing many tons to the cubic inch, were located.

From a study of the frequency of giant stellar explosions in distant galaxies it was estimated that a tenth of the stars in our own system might have exploded since the cooling of the earth's oldest rocks.

Shells of gaseous iron, discovered around certain stars afforded a clue to possible new facts with important earthly applications.

A theory to explain mysterious changes in the spectrum of the star beta Lyrae was advanced, suggesting that the star had the shape of an hour-glass, and a curved, comet-like tail.

A rare transit of the planet Mercury across the face of the sun, last until 1953, occurred on Nov. 11, and was widely observed, despite bad weather.

The five naked-eye planets, Mercury, Venus, Mars, Jupiter and Saturn, were lined up in the western sky in a rare formation.

A theory was advanced that the planet Venus is covered with clouds of solidified formaldehyde, deadly gas used on earth as a disinfectant.

Theories that the planetary system was formed by condensation of a great gaseous mass pulled out of the sun were shown to be untenable by a demonstration that such a mass would not condense but would dissipate.

The cosmic dust which permeates interstellar space was found to be very unevenly distributed.

The iron in meteorites was found to contain the same forms or "isotopes" and in the same proportions as iron originating on earth.

The world's highest astronomical observatory was established at Fremont Pass, Colo., an altitude of 11,318 feet, as a branch of the Harvard College Observatory for study of the sun's corona without an eclipse.

A reflecting telescope with a five-foot diameter mirror was placed in operation at the Argentine National Observatory in Cordoba.

A telescope attachment known as the "quartz monochromator" made possible a new way of observing the flame-like prominences on the sun.

A new tower telescope and laboratory building, for motion picture studies of the sun, was dedicated at the McMath-Hulbert Observatory of the University of Michigan.

Cook Observatory, at Wynnewood, Pa., one of the finest of amateur institutions, was turned over to the University of Pennsylvania following the death of its founder, Dr. Gustavus Wynne Cook.

Improved designs of the now-famous Schmidt camera for astronomical photography were suggested, and a large new telescope of this type was completed at the Oak Ridge Station of the Harvard College Observatory.

Studies of an eclipse of the moon in Oct. 1939, completed during the year, showed that an inch thick layer of pumice on its surface would explain the observed rate of cooling.

On April 7 an annular eclipse of the sun was visible in the southern United States and observations were made of the infra-red light from the sun's rim as the moon covered the center of the disc.

The path of totality of a solar eclipse on Oct. 1 passed over Brazil and South Africa, but, in the former, cloudy weather hampered many of the observations.

BIOLOGICAL SCIENCES

New Wild Ox Described; Plants Make Food in Dark

A hitherto undescribed large mammal, the kouprey or wild ox of Indo-China, was introduced to science; it is the first "new" mammal of major size to be described since the discovery of the okapi more than a generation ago.

One-celled green water plants were discovered to be able to absorb carbon dioxide and form food in the dark, also to make use of hydrogen as an energy source.

Green plants were discovered to be able to manufacture a bacteriophage to protect themselves against germ diseases, and molds were also found to produce a bacteria-killing substance.

Plant disease viruses, hitherto known only as parasites, were found to be able to feed on non-living materials.

Plants recovering from certain virus diseases were found to have acquired immunity to further attacks.

Discovery of a highly fatal disease of Japanese beetle larvae gave hope of establishing biological control of this pest.

A new kind of chlorophyll was found in a variety of jimsonweed artificially "evolved" by X-ray bombardment.

Close observation of developing embryos in eggs was made possible by invention of a technique involving making of windows in ends of eggshells.

Green plants give off very faint flashes of red light while making food, it was discovered.

Ability of cockroaches to get along without vitamin A, supposed to be essential to all life, was discovered.

White pines resistant to blister rust were discovered in Wisconsin.

It was discovered that the value of rabies vaccine for dogs could be tested on mice.

Barro Colorado island in Gatun lake became a U. S. government project, where scientists may study tropical animals and plants under natural wilderness conditions.

Pigmy hippos and other rare animals were

brought back from Liberia by an expedition from the National Zoological Park.

The 3,000-head buffalo herd at Wainwright Park, Alberta, was slaughtered to make room for a great flying field.

A fatal epidemic among sponges in Florida and West Indian waters appeared in the spring, and abated in autumn after killing a large percentage of the most valuable sponges.

Sulfanilamide was found to be a stimulant for formation of roots on plant cuttings.

The chromosome number in the chimpanzee was found to be 48, the same as in man.

Multiple cropping, producing two or more kinds of plants in the same tank at the same time, was the newest development in hydroponics, or soilless gardening.

A short-legged coyote, built on dachshund lines, was found in California.

The Leidy Medal, awarded once in three years to an outstanding researcher in the natural sciences, was presented to Prof. W. L. Fernald, Harvard University botanist.

International good will among scientists was signalized in the award to Sir Arthur William Hill, director of the Royal Botanic Gardens at Kew, England, of the George Robert White Medal of the Massachusetts Horticultural Society.

The National Academy of Sciences awarded the Agassiz medal for Oceanography to Dr. Frank R. Lillie, past president of the Woods Hole Oceanographic Institution.

CHEMISTRY AND PHYSICS

Power From the Atom Is Brought a Step Nearer

Atomic power, long a dream of science, was brought a step nearer with the actual isolation of minute quantities of Uranium 235, the form, or isotope, of this metal which when once started disintegrating by bombardment with atomic fragments, continues the process with the liberation of tremendous amounts of energy.

Produced commercially for the first time in the United States, a microscope which sees with electrons instead of light, opened many new fields in medical, physical and industrial research.

Pictures made with the electron microscope showed the true form of the silver grains of the photographic image; formerly believed to be like lumps of coke, they proved to resemble masses of seaweed.

Experiments with the klystron tube using large amounts of power at ultra-high frequencies were successful in transmitting wireless power a distance of many feet.

Cyclotrons, powerful atom smashers and machines for making artificially radioactive substances, increased in number, with 16 in the United States finished or under construction; one of which will have magnets 184 inches in diameter and will cost \$1,400,000.

A million-volt X-ray outfit, adequate for deep therapy and for examination of castings, yet small enough to wheel through an ordinary door and operable from an ordinary lighting circuit, was demonstrated.

Preparation of artificially radioactive elements advanced rapidly, with the first preparation of one, radioactive yttrium, that may have important industrial applications.

Measurements of the energies binding together the protons and neutrons of which the hearts of atoms are built were accomplished by bombarding carbon and paraffin with high energy neutrons, the atom-smashing bullets.

An electron induction accelerator was devel-

oped, from which electrons are emitted with energies of 2,300,000 volts, equivalent to those from ten milligrams of radium.

The total eclipse of the sun, visible in Brazil, was found to have an effect on the cosmic rays.

To learn more about cosmic rays, they were studied from many places, including Little America, India, a mountain top in Colorado, and unmanned clusters of balloons sent 12 miles or more into the air.

The mesotrons, an important part of the cosmic rays reaching the earth and which are formed high in the air when the atmospheric atoms are struck by other rays from outer space, were found to have a short life, a few millionths of a second.

Neutrons, atomic particles having no electrical charge, were found to be associated with the cosmic radiation, and experiments were started to measure them at various latitudes to correlate them with other forms of the cosmic rays.

A photograph was obtained showing a mesotron, one of the heavy weight kind of electrons that occur in cosmic rays, disintegrating into an ordinary electron, thus confirming a prediction.

A new theory of relativity was devised which makes space flat instead of curved and explains puzzling experiments which seemed to show a drift of space through the "ether."

Radio waves transmitted by atoms were discovered and measured, making possible great improvements in the accuracy of measuring such subtle properties of atoms and molecules as the magnetism of their component parts. This work by Dr. I. I. Rabi, of Columbia University was awarded the \$1,000 prize of the A.A.A.S.

Methods were found by which the invisible films on glass that prevent reflection and increase the efficiency of lens systems could be made as permanent as the glass itself.

Pressures as high as 3,500,000 pounds per square inch were obtained in laboratory experiments, to duplicate the pressures to which materials are subjected far underground.

Franklin medals were awarded to Dr. Arthur H. Compton, University of Chicago physicist, and Dr. Leo H. Baekeland, chemist, inventor of bakelite and velox photographic paper.

The Royal Society conferred its Copley Medal on Prof. Paul Langevin, French physicist; while its Davy Medal went to Prof. Harold C. Urey, of Columbia University, discoverer of heavy hydrogen, and the Hughes Medal to Prof. Arthur H. Compton, of the University of Chicago, authority on cosmic rays.

Two new methods of making three dimensional photographs as prints that do not require the old-fashioned stereoscope to view them were introduced.

The natural process by which glucose is converted in plants into starch was duplicated in the laboratory for the first time, pointing the way to possible synthesis of foods.

A new synthetic rubber was announced, made from gases formerly wasted in oil refineries, which is much more stable than natural rubber because of the structure of its molecules; and tires, made from another kind of synthetic rubber, were placed on the market.

Melamine was made commercially in large quantities and used in a new family of resins for molding and enamels.

A new chemical treatment was developed that makes hard wood soft and plastic while hot and permits a return to natural stiffness and strength upon cooling.

A method was found by which zeolites, materials widely used in water softening, can be used to separate the isotopes or twin forms of various elements; it may prove useful in obtaining atomic power-producing isotope 235 of uranium. (Turn to page 398)



APPROACHES SPEED OF LIGHT

This new electron accelerator in its glass doughnut-shaped vacuum tube, gives electrons a speed approaching that of light. Dr. D. W. Kerst, of the General Electric Research Laboratory, designer of the instrument, is shown using an electroscope to measure the intensity of the radiation produced.

From Page 389

Reports from Finland suggested that there may be a fourth series of elements that disintegrate like radium.

A heavy isotope of sulfur, making up about four per cent of ordinary sulfur, was isolated in pure form for the first time.

Elements 93 and 94, heavier than uranium, formerly supposed to have the heaviest possible atoms, were obtained in the laboratory, one of which, it was reported, lasted for several days, while the other decomposed with greater rapidity.

Carbon isotope 14, of which half decays in 1000 years, was obtained by exposing ammonium nitrate to the rays of a cyclotron; it may prove important in biology because of its long life.

Liquids obtained from wood were seen as the raw material for a new chemical industry.

As had happened several times previously, the discovery of element No. 85 was announced, though it was not accepted by chemists, pending further confirmation.

New uses were found for nylon, among them photographic film and cords in tires.

A new plant was opened for the large scale synthetic manufacture of phenol, or carbolic

acid, important chemical of the plastics industry.

A method was discovered by which coal and oil can be made in the laboratory from plant carbohydrates, thus accomplishing in a few hours what has taken nature millions of years.

Glycerine was made from petroleum by a new process.

EARTH SCIENCES

Many Earthquakes Occurred Rumanian Shock was Worst

A severe earthquake caused widespread death and destruction in Rumania on Nov. 10; during the year there were 37 other quakes sufficiently severe to register themselves on distant seismographs.

The U. S. Weather Bureau initiated the making and broadcasting of five-day weather forecasts, based largely on air mass analyses.

U. S. Coast Guard cutters served as "weather ships," taking observations at sea to replace those formerly sent by merchant ships now silencing their radios because of the war.

A violent snowstorm that suddenly struck the

upper Mississippi valley and the Lake states in mid-November caused the death of many duck hunters and sailors and seriously disrupted traffic.

The most severe magnetic storm since 1921 occurred on Easter Sunday, seriously interfering with wire and radio communications.

The nearly complete fossil skeleton of a Uintatherium, giant six-horned beast of 30 million years ago, was discovered in Wyoming.

The practically complete skeleton of a young elephant of Pliocene date was unearthed in Siberia.

Wormholes in fossil wood, a great geological rarity, were discovered in a petrified forest in China.

Great Smoky Mountains National Park was dedicated by President Roosevelt on Labor Day.

ENGINEERING AND TECHNOLOGY

Three-Month Predictions Will Aid Broadcasting

It was found possible to predict three months in advance the best frequencies to use for dependable radio transmission.

Recorded music of orchestra, organ and choir was reproduced with its original tonal range and spatial sense, and a tenfold greater range of loudness.

Coastal-harbor radio stations opened at Wilmington, Charleston, Tampa and Galveston make radio telephone service available to small watercraft along the entire ocean and Gulf coast of the United States.

Direct radio telephone channels from the United States were established during 1940 to LaPaz, Berlin, Berne and Madrid.

The VU, a new unit of sound volume for electrical circuits, was adopted by telephone engineers, broadcasters, and instrument manufacturers.

The Federal Communications Commission permitted the high-fidelity frequency modulated radio to go into use, but held up authorization of commercial television until there was more agreement concerning standards.

Television by radio in natural color, using a single channel, was accomplished.

A television program covering the Republican convention in Philadelphia was transmitted over the coaxial telephone cable to New York and then broadcast by radio.

Simple television apparatus was introduced, making it possible for radio amateurs to experiment in this field.

Television views were transmitted from an airplane to the ground.

New dustless and sliverless copper was developed to reduce short circuits in electric wiring.

New dams in the Pacific northwest gave that part of America the cheapest commercial electric power.

The Pennsylvania turnpike, a 160-mile road without crossroads, was opened between Harrisburg and Pittsburgh.

The biggest steam turbine made since 1930, capable of 80,000 kilowatts, was completed.

New values of the viscosity of steam at high pressures and temperatures were made available.

The largest conveyor belt system carried 1,100 tons of gravel, sand and crushed rock per hour a distance of 9.6 miles to Shasta Dam.

A new electric phonograph was introduced in which reproduction is accomplished with a dancing light beam.

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A suspension bridge near Tacoma, Wash., was opened, becoming the third largest in the world, but a few months later it collapsed in a gale.

MATHEMATICS

Four Colors Suffice For 35 Regions on Sphere

In the so-called four-color problem it was shown that any map on a sphere containing 35 or fewer regions can be colored with four colors; this is an extension of 4 beyond the number 31 reported in 1938.

It was shown that a square can be cut up into a finite number of smaller squares no two of which are of the same size; for many years it had been supposed that this was impossible.

A computing machine was developed for multiplying and dividing complex numbers, constructed largely of telephone relays and switches.

An automatic machine to play the mathematical game of Nim was constructed, and exhibited at the New York World's Fair.

The fundamental algebraic notion of a group under an operation of multiplication was widened in various ways, notably in order to include cases where the operation acts on more than two elements.

New results were obtained in the theory of fields, particularly modular fields and p -adic number fields.

Some of the algebraic methods which had been applied previously to the difficult problem of smoothing-out the singular points on two-dimensional surfaces were successfully extended to higher-dimensional surfaces.

New and definitive contributions to lattice theory appeared, emphasizing the very wide applications of lattices to the combinations of given algebraic systems; to the subspaces of geometric spaces, both Euclidean and non-Euclidean; to the basic concepts of topology; and to the theory of probability with important bearings on modern physics.

In mathematical statistics, the problem of lengths of runs was extensively investigated.

Considerable advance was made in the theory of integral equations, particularly for a type of integral equation encountered in many problems of dynamics and quantum mechanics.

Extensive use was made of fractional differentiation and integration in the evaluation of definite integrals.

The notion of an integral was extended from ordinary space to various types of abstract spaces, in particular to those known as Banach spaces.

A new notion of curvature was advanced, a strictly local property of a space, which can be integrated over the whole space to give a result which is closely connected with the topological structure of the space.

Necessary and sufficient conditions were obtained for the regularity of Hausdorff transformations of a certain type in terms of the related continued fraction.

MEDICAL SCIENCES

Measles Vaccine Developed; Thiamin Aids Alertness

Development of a new measles vaccine and its success in clinical trials on a small group of children was announced.

New evidence of the importance of thiamin, or vitamin B₁, not only for preventing disease and minor degrees of ill health, but for increasing the alertness and capacity for physical work in persons of ordinary good health was obtained from diet studies on human subjects.

Lack of riboflavin, one of the B vitamins, in the diet was discovered to cause keratitis and cure of the condition by riboflavin was announced.

Synthesis of pantothenic acid, one of the B vitamins, and its identification as an adrenal gland-protecting factor for rats, and its usefulness in human nutrition were announced.

A new vaccine from influenza and distemper viruses was found to give ferrets solid immunity against several strains of influenza and was tried on humans during an epidemic in Puerto Rico but without definite conclusions.

A second virus cause of influenza, to be known as Influenza B virus, was discovered and found to cause epidemics in alternating cycles with Influenza A virus.

Sulfathiazole was announced as an improved remedy for pneumonia and as a valuable remedy for staphylococcal infections and as a possible cure for bubonic plague.

Evidence of regression of cancer achieved by treatment of patients with fast neutron rays from the cyclotron was reported.

Neutrons slowed down by boron proved five times as effective as fast neutrons in destroying cancer tissue in test-tube experiments and cured transplanted cancer in mice.

"Air bends" or aeroembolism, occurring in rapid ascents to high altitudes, can be prevented by oxygen inhalation treatment before taking off.

Signs of heart damage due to oxygen lack were discovered in flyers at altitudes as low as 5,000 feet.

A diet, adequate to provide adequate nourishment for a year at a cost of less than two dollars per year, has been announced as satisfactory except for the deficiency of one vitamin, which can be provided with the addition of tomato juice, and calories and bulk to satisfy stomach hunger.

A "pocket size" emergency oxygen inhalation apparatus for parachute descents from high altitudes was devised.

Five groups of eye defects significant in certain types of work and new tests for detecting them were announced together with a theory of job selection on an eyesight basis.

A vanishing cream that protects against poison ivy was developed.

A serum for treating Rocky Mountain spotted fever was developed.

Two kidney extracts were reported to give relief from high blood pressure.

Isolation from soil bacilli of chemicals capable of destroying a large range of pathogenic microorganisms and promising results with the use of one of them, gramacidin, in treatment of chronic bovine mastitis, were announced.

Successful vein grafting or splicing was accomplished with the aid of the anti-blood clotting chemical heparin.

Sulfanilylguanidine was announced as a promising remedy for bacillary dysentery and other intestinal infections.

A muscle-splicing operation, in which bands of diseased tissue within the muscles were removed, was devised for rehabilitating useless muscles of infantile paralysis victims.

Test-tube transformation, for the first time, of living mammalian cells into cells of apparently radically different type which may be cancer cells was achieved by methylcholanthrene treatment in search for the secret of the change of

normal cells into cancer cells and suggested that a change in the cell membrane may be crucial to the transformation of normal to cancer cells under chemical treatment.

Cancer-causing substances, it was announced, have been extracted from the presumably healthy livers of cancer patients and, apparently for the first time, from human breast cancers.

Cancer cells were turned toward normal in metabolic activity by starvation treatment of the cells aided by insulin.

Financial aid to indigent cancer patients and also establishment and maintenance of cancer clinics, hospitals or laboratories will be possible through the reorganization this year of the American Society for the Control of Cancer.

Zinc peroxide treatment was used successfully to relieve pain and clear up infected ulcers in hopeless cancer patients, enabling some of them to continue with needed irradiation treatment.

A new route by which cancer cells and disease germs can spread through the body, by-passing the heart and lungs, and thus in the case of cancer giving a false sense of security in prognosis based on lung involvement, was discovered in the valveless vertebral veins.

Discovery that glutamic acid occurs naturally in both right-handed and left-handed forms refuted the idea that appearance of the left-handed form in the body was an indication of cancer.

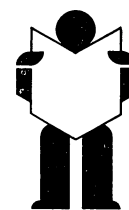
A grant of \$35,000 yearly for two years was made by the National Foundation for Infantile Paralysis to the National Research Council for fellowships in infantile paralysis research.

Antibodies that can inactivate influenza virus were discovered in human nasal secretions and seen as a possible protection along with a change seen during influenza in the cells of respiratory mucous membrane of ferrets.

Cirrhosis of the liver in rabbits was produced by a diet lacking in a substance found in yeast and thought to be choline.

Evidence showing that the liver is of funda-

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mental importance in the formation of prothrombin and in the metabolism of vitamin K was reported.

Improvement in Parkinson's disease (paralysis agitans) following treatment with pyridoxine, or vitamin B₆ was announced.

Success in carefully controlled treatment of prostate gland disease with the synthetic female sex hormone, stilbestrol, in dogs was announced.

A hyperimmune rabbit serum for treatment of equine encephalomyelitis was developed and found to give good results in laboratory animals.

Aluminum treatment of silicosis in human patients was begun and early encouraging results were reported.

Success in treatment of muscular dystrophy, amyotrophic lateral sclerosis, peroneal muscular atrophy and amyotonia congenita with vitamin E was reported.

The mouse anti-baldness dietary factor was identified as inositol.

Poor diet was found to decrease the resistance of young rats to a neurotropic virus, suggesting that dietary deficiency may be a factor in virus diseases such as infantile paralysis.

Treatment with vitamins E and B was reported to have restored the function of muscles disabled by infantile paralysis and other diseases.

Thiamin was discovered to be an antidote for the depressing effects of tropical heat.

A new role for thiamin, that of protecting blood vessels from damage, was discovered.

Deficiency of vitamin B₆ (pyridoxine) and potassium caused heart muscle damage and death in young pigs and rats.

Discovery of a new, unidentified B vitamin, necessary to prevent slipped tendon disease or perosis in chicks, was announced.

Sulfamethylthiazole was announced as a cure for staphylococcal septicemia and as a pneumonia remedy.

Sulfanilamide was reported to prevent scarlet fever and to be successful in treating recurrent lymphocytic choriomeningitis and an eye infection from the virus of venereal lymphogranuloma.

Electron microscope studies showed that the streptococcus has a rigid outer membrane accounting for the grouping of these germs in chains.

A world-wide influenza epidemic was predicted by many authorities for 1940-1941 on the basis of 25-year pandemic cycles.

Encouraging results in attempts to protect animals against infantile paralysis by injecting a vaccine into the brain and spinal cord were announced.

Tonsillectomy appeared to predispose to infantile paralysis, a survey showed.

Infantile paralysis epidemics were linked with a recent trend in sewage disposal methods, especially in small towns; and chlorination of drinking water and swimming pool water as now practised was found insufficient to kill the infantile paralysis virus.

Successful vaccination of monkeys against infantile paralysis with a virus that causes the disease in mice was reported.

First proved epidemic in the United States of Australian "Q" fever was announced with the suggestion that the organism is the cause of many cases of atypical pneumonia.

An experimental vaccine for protection against "Q" fever was developed.

A record of 401 operations for relief of Ménière's disease with one death and 400 permanent cures was announced.

Relief of Ménière's disease by the chemical histamine in 49 patients was announced.

A hitherto unknown enzyme in the blood which breaks down heroin and other morphine compounds was discovered.

Apparently permanent cure of diabetes in cats was achieved by insulin treatment in experiments giving new knowledge of the tissue damage in diabetes and emphasizing the importance of early, thorough treatment of the disease in humans.

Inhalations of 100% oxygen were found to give relief from attacks of angina pectoris.

Muscle storage of iron was discovered for the first time in studies with artificially radioactive iron.

A new pneumonia germ, pneumococcus Type 33, was discovered and a serum for treating it was prepared.

Large scale field trials of two typhus fever vaccines were started in Central Europe.

A research unit to be concerned entirely with problems of aging was organized at the U. S. National Institute of Health.

Promin, a new sulfa drug, showed promise as a remedy for experimental tuberculosis in guinea pigs.

Isolation of extracts from the kidneys, one of which lowers blood pressure, another of which raises blood pressure, others which produce thrombosis and still others which produce hemorrhage, is expected to throw light on the role of the kidneys in various manifestations of cardiovascular disease.

England added thiamin to its flour as a war nutritional measure.

PSYCHIATRY AND PSYCHOLOGY

Electric Shock Therapy Given First U. S. Trials

Electric shock therapy, a method of treating mental disease by passing an electric current directly through the brain, was introduced in the United States.

The ink blot test, familiar as a measure of imagination, was used successfully to predict which mental patients would respond to the new insulin shock treatment, and to distinguish neurotics from those with uncomplicated mental disease.

Actual measurement of how an individual behaves when approaching a nervous breakdown was made possible by a new technique developed in experiments with animals.

The Stanford Binet, familiar test for measuring intelligence, can be adapted to detect early stages of mental disease, it was reported.

Abnormally slow brain waves, rare in normal children, were found to be relatively common among problem children.

Brain waves were put to practical use in the rejection of would-be pilots found to have brain waves believed characteristic of epilepsy.

Strychnine dropped into the eyes was found to improve vision impaired at high altitudes, indicating that the narrowed field of vision of a person suffering oxygen deprivation is a matter of eyesight rather than mere attention.

With a special pneumatic grip on the control stick, it was found possible to measure the tenseness of student pilots while making various maneuvers during flight, take-off and landing; overtense individuals make poor students, it was found.

Lights flashing in the eye were found to produce electric waves in the brain (not the brain waves originating there) so sharply localized that it was possible to map the area governing vision by electroplotting the exact position where the signals could be picked up.

Learning ordinarily requiring the important temporal area of the brain's cortex can take

place sub-cortically, it was demonstrated when the temporal area in animals was either rendered useless by the drug curare or completely removed.

Airsickness, which can be produced in the laboratory by mild electric shock through the ears, can also be produced by "conditioning" it was found when simultaneous ringing of a bell with the shock taught individuals to sway or fall over when later they heard the bell alone.

Theories of learning were affected by discovery that an individual conditioned in deep hypnotic sleep by smelling creosote during the ringing of a bell will afterwards in waking state have a vivid image of the odor of creosote whenever he hears that bell, and without any remembered associations.

Learning by organizing material in close connection with the situation was demonstrated to be more efficient and subject to transfer than ordinary rote memorizing or verbal generalizing.

All individuals, regardless of age, sex, or state of mind are equally sensitive to pain, it was discovered by a new technique which opens the door to new laboratory experiments on the effects of pain-relieving drugs.

Hunger does not exist as a single manifestation, it was found; instead there are at least 10 specific hungers: for protein, fat, carbohydrate, water, oxygen, salt, phosphorus, sodium, calcium and the vitamin B complex.

The span of visual attention, that is the number of dots that can be seen in a fraction of a second, was shown to depend on the exposure time and the light intensity; the shorter the exposure time, the greater is the light intensity required.

The excitability of the visual receptor was found to be cyclic, even with constant stimulation; at the end of the cycle the receptor discharges, and thereafter requires recovery during another cycle before it discharges again.

When a uniform area of the eye is stimulated by light, it was found that there is greater nervous excitation near the center of the area than at the edges.

Sounds can be heard as coming from different directions, not only horizontally as has long been known, but also vertically, it was found, provided you turn your head while listening.

Color vision and ability to distinguish small differences of color were observed to be equally developed in man and in chimpanzee, though man does somewhat better with the reds.

Monkeys without the important frontal lobes of their brains, were found able to use a combination of tools in a way previously considered exclusively human, but were unable to assemble the tools from different sides of the cage—a problem within their ability when they had the frontal lobes.

Five leading psychological organizations appointed representatives to cooperate with the National Research Council in making the services of psychologists available to the government in the present emergency.

A number of organizations became concerned with the psychological factors involved in morale; a conference of 25 psychologists discussed and reached an agreement concerning certain factors involved.

Public opinion polls reduced their average error between 2 and 3 per cent in predicting the outcome of the November elections, thus establishing themselves with some security as perhaps the first technique in the social sciences to achieve scientific prediction of coming events.

A method was developed for classifying body types which may make it possible to solve certain long-standing problems of relation between development and bodily constitution.