

Science Strides Onward in 1936

Huge Bridges, Dams, Drought Vie With Fatherless Rabbits, Brain Waves, Vitamins, New Stars and Ancient Man

By SCIENCE SERVICE STAFF

OUTSTANDING 1936 achievements in ten fields of science as selected by Science Service are:

Aeronautics—The completion of the world's largest high speed wind tunnel at Langley Field, Va.

Archaeology—Pronouncement that Peking man, who lived over 500,000 years ago in China, was direct ancestor of modern man.

Astronomy—An unprecedented number of novae, the discovery of titanium gas in interstellar space and the observation of the total eclipse of June 19.

Biology—The causing of first stages of embryonic development of rabbit ova by treatment with chemicals and heat.

Chemistry—Production of enzymes by chemical methods and the finding of a chemical compound containing an enzyme. Synthesis of vitamin B₁.

Engineering—Completion of Boulder Dam, the San Francisco-Oakland bridge, Triborough bridge, and other large engineering projects.

Earth Sciences—Violent climatic contrasts consisting of the coldest and snowiest winter followed by hottest summer and worst droughts in Midwest and Northwest and destructive floods in East and South.

Medicine—Development and use of protamine insulin for treatment of diabetes; discovery of a new yellow fever menace in Brazilian jungle fever, necessitating a new approach in yellow fever control, and cultivation of a safer strain of yellow fever virus for vaccination.

Physics—First synthesis of a naturally occurring radioactive element.

Psychology—Demonstrations that electrical phenomena in brain and body can chart emotions and learning processes.

Among the advances in science during 1936 were:

Aeronautics

The world's largest high speed wind tunnel in which airplane models can be studied in wind speeds of over 500 miles an hour was opened at the Langley Field Laboratories of the National Advisory Committee for Aeronautics.

Regular commercial seaplane service across the Pacific Ocean was inaugurated by the Martin China Clipper of Pan-American Airways.

A series of regular scheduled trans-Atlantic airship crossings by the giant German Zeppelin Hindenburg was inaugurated.

Inauguration of transcontinental commercial transport sleepers of the D.S.T. type.

Using large models 1/40 actual size, scientists of the National Advisory Committee for Aeronautics at Langley Field, Va., have found that the vertical lifting forces on an airship the size of the late S.S. *Akron* can be as great as 25,000 pounds in a wind of only 20 miles an hour when moored 95 feet above the ground at an angle to the wind of 60 degrees, a condition that may exist in ground handling.

The development and delivery to the Bureau of Air Commerce of the roadable autogiro constructed by the Pitcairn Autogiro Company.

Development and use of 1,000 h.p. radial air-cooled engines, both the Pratt and Whitney and Wright types.

Development of 100 octane fuel for airplane engines.

Disclosure of the long secret achievements of the rocket research of Prof. Robert Goddard of Clark University, made at Roswell, N. M., showed that automatically vertical flight to altitudes of 7,500 feet had been obtained and speeds of over 700 miles an hour. All problems thus solved it remains only to construct rockets to known design for any desired altitude.

The Diesel powered seaplanes of the German Lufthansa made flights from the Azores to Long Island, N. Y., as initial steps in proposed trans-Atlantic commercial flights.

Four-engined bombing airplanes were developed by the Boeing Co. and reported to exceed the speed of leading pursuit planes and would thus be capable of entering aerial fighting tactics.

The use of high lift devices on airplane wings by Sikorsky and Douglas increased the speed range of airplanes and yielded greater economy of flight.

All American commercial airlines adopted modern acoustical discoveries to soundproof airplane cabins.

The Army Air Corps and Bureau of Air Commerce demonstrated radio aids for accomplishing "blind landings" of airplanes.

The U.S. Navy in cooperation with Massachusetts Institute of Technology developed the Draper electro-magnetic apparatus for recording of engines and airplane parts vibrations while in flight.

The general adoption throughout the world of the Hamilton standard constant speed, variable pitch propeller, now made feathering when stopped, permitted sub-

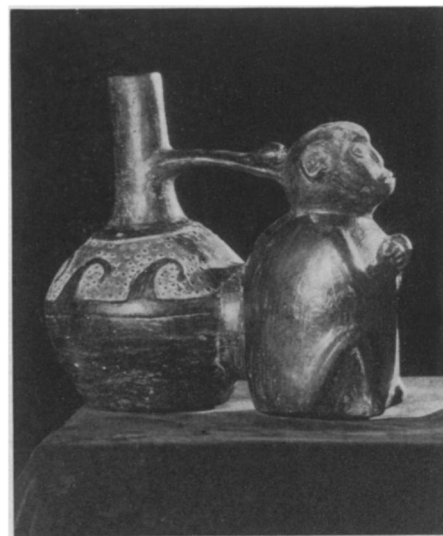
stantially large pay loads to be taken into the air with existing airplanes.

The U.S. Bureau of Air Commerce obtained a robot, dummy, hooded cockpit for use in training for blind flying by radio beams and instruments.

Small unmanned balloons equipped with robot radio transmitting sets were used for automatic recording of upper air weather information and cosmic ray data in the field tests of Dr. Thomas Johnson, Bartol Research Foundation, and of a joint expedition of Harvard University and Massachusetts Institute of Technology under the direction of Dr. K. O. Lange.

The first airplane to fly across the United States from coast to coast—the battered 1911 plane of Galbraith Perry Rodgers—was deposited at the Smithsonian Institution museum in Washington as a historic aviation relic.

New official records for airplanes for 1936 include: altitude 48,697.405 feet by Georges Detre, France, on August 14; altitude with payload of 500 kilograms (1102.311 lbs.) by Vladimir Kokkinaki, U.S.S.R., at 43,234.817 feet on August 3; altitude with payload of 1000 kilograms (2204.622 lbs.) by Vladimir Kokkinaki, U.S.S.R., at 39,701.364 feet on August 21; altitude with payload of 10,000 kilograms (22,046 lbs.) by Youmacheff and Kalachnikoff, U.S.S.R., at 21,669.902 feet on Sept. 16; these last pilots also broke the record for maximum load flown at altitude of 2,000 meters (6,561.666 feet) by carrying 12,000 kilograms (26,455.464 lbs.) on



WHISTLING MONKEY

A monkey jar with a whistle in it figures in the big collection of prehistoric Indian pottery that an expedition of the American Museum of Natural History has unearthed on the coast of Peru. The snub-nosed monkey dates from the Late Chimú era, which preceded the rise of the Incas about the twelfth century A.D.

a flight on Sept. 20. Only official air records gained by Americans in 1936 were: airline distance for light airplanes at 1,986.942 miles by Robert D. Buck and Lee Bellingrath; distance for light seaplanes by Borntraeger and Stafford at 241.699 miles; altitude for light seaplanes at 11,558.364 feet by Mr. and Mrs. Terris Moore; airline distance for amphibian planes at 1,429.685 miles by Major General F. M. Andrews and Major John Whiteley; altitude for amphibian planes by Boris Sergievsky at 24,950.712 feet; altitudes with payloads of 500, 1000 and 2000 kilograms in amphibian planes by Boris Sergievsky at 24,950.712, 19,625.925 feet and 19,625.925 feet respectively.

A potential new aid for blind landings in fog-bound airports was provided in the patent granted to John Hays Hammond, Jr., for the use of television to airplanes so that the pilot could at all times have a picture of actual conditions at the airport before him.

Anthropology and Archaeology

Peking Man—inhabitant of Choukoutien caves in China over half a million years ago—was a direct ancestor of recent man, and a type independent of Neandertal Man and far more primitive, Dr. Franz Weidenreich, Peking Union Medical College, concluded.

"The oldest known Englishman" title was claimed for the skull which has been coming to light in successive discoveries in the Thames Valley, as a result of excavations in gravel 24 feet under ground, by Dr. A. T. Marston, London dentist and archaeologist.

The verdict that a new species of fossil ape with certain man-like characters, discovered at Sterkfontein, South Africa, is probably of Upper Pleistocene age, hence contemporary with man, not an ancestral form, was announced by Dr. Robert Broom of the Transvaal Museum.

The human race became definitely human between Pliocene and Pleistocene times, about 1,000,000 years ago, Prof. Hellmut de Terra, Yale, estimated.

Seeking new light on prehistoric man in Alaska, Dr. Ales Hrdlicka of the U.S. National Museum explored two Aleutian burial caves containing numerous mummies, and also discovered an Aleut skull pronounced the largest normal skull known in America.

The American population includes nine physical groups, the largest consisting of Nordics mixed with other types, Prof. E. A. Hooton, Harvard University, reported.

A 4-year study of New England speech, which will become part of a linguistic atlas of the United States and Canada, was completed under the direction of Dr. Hans Kurath, Brown University.

Physical traits of 2,000 Irish women and 10,000 Irish men were recorded by Harvard University anthropologists working in Ireland.

Blood types of ancient Egyptians were determined by Dr. P. B. Candela, Brooklyn physician, from their dry bones subjected to biochemical test.

Dr. Edgar B. Howard, leader of a joint expedition, succeeded in dating Folsom Man in America more definitely by find-

ing man-made weapons associated with bones of prehistoric elephants and by having scientific witnesses confirm the geology and climatology as indicating antiquity of about 10,000 years for the event.

Tombs of ancient American rulers were discovered by the Carnegie Institution of Washington, in a group of Mayan pyramids in Guatemalan highlands, shedding new light on the Old Mayan Empire.

A culture in the Uluva River region of Honduras, ancestral to that of the Mayas, was unearthed by Dr. W. D. Strong, leading an expedition for the Bureau of American Ethnology and Harvard University.

A prehistoric Indian settlement described as three miles long in Ponca Creek Valley, Nebraska, was explored by Prof. Earl H. Bell, University of Nebraska.

To make a great exhibit of prehistoric art, Prof. Leo Frobenius, Goethe Museum, Germany, completed the task of copying 3,500 pictures on cave walls and cliffsides.

An Ivory Apollo by a very fine Athenian sculptor climaxed the sixth season of excavation in the Agora by the American School for Classical Studies at Athens.

Long-sought light on early medieval art in the Near East was obtained when 260 mosaics were recovered from ruins of Antioch in Syria, by an international expedition of American and French institutions.

The scene of the Trojan War was shifted again, as the University of Cincinnati expedition confirmed a suspicion that the seventh layer, not the sixth, in the mound of Hissarlik holds the ruins of King Priam's city.

For the first time, extent of King Xerxes' Persian Empire was revealed, when a tablet listing the lands he conquered was unearthed in Iran (Persia) by the Oriental Institute of the University of Chicago.

Yale scientists excavating at Dura on the Euphrates discovered an elaborate temple to the Syrian god Hadad the Thunderer, and also the headquarters of the governor in Roman Empire days.

At Tepe Gawra, Mesopotamia, where the "world's oldest city" is being probed, American archaeologists pushed the digging through a thirteenth level of occupation and found notably in ruins of about 4000 B.C. a great round temple-tower like those built in Bible cities 3,000 years later.

Study of inscriptions from Ras Shamra, Syria, led Dr. J. J. Obermann, Yale, to report that the Greeks got their alphabet system from this cuneiform writing, and not from the Phoenicians, and also that literary ancestry of the Hebrew psalms can be traced to Canaanite writings at Ras Shamra.

The tomb and remains of an Egyptian princess, possibly the daughter of Pharaoh Chephren, were discovered near the Gizeh pyramids by Prof. Selim Hassan, Egyptian University.

The Egyptian Expedition of the Metropolitan Museum re-investigated at Thebes the tomb of Sen-Mut, architect and favorite of Queen Hatshepsut, and discovered the tomb of his parents.

An ox cult, unique in archaeological records, was discovered in the Limpopo Valley, Transvaal, Africa, when Capt. G. A. Gardner unearthed a very early Bantu habitation of possibly 900 A.D. and found an ox buried with human ceremony.

Making trial diggings in the Peshawar District of India, Mlle. Simone Corbiau, excavating for the Brussels Museum, struck archaic objects which she tentatively pronounced older than the famous 3000 B.C. civilization in India, and probably dating from 4,000 to 3,500 B.C.

New light on India's civilization in 3000 B.C., was found at Chanhu-daro, where American archaeologists unearthed ruins of a city that made toys and other articles in quantity for trade.

Astronomy

A total eclipse of the sun, with a totality area extending from Algeria across Asia to Japan, was extensively observed on June 19.

Eclipse observations by the Harvard-Massachusetts Institute of Technology expedition showed several new coronal lines and indicated to Dr. Donald H. Menzel of Harvard a close connection between high excitation in the chromosphere and the strength of the as yet unsolved coronal radiation.

Sunspots increased in number as the cycle progressed toward the next maximum which will probably occur in 1939.

The first modern study of the granulation on the surface of the sun was made by Prof. Harry Plaskett at Oxford.

Motion pictures of solar prominences were made at the McMath-Hulbert Observatory, Mich., and shown by Dr. H. D. Curtis at the Harvard Tercentenary Conference.

A new theory of the origin of the solar system was advanced by Dr. R. A. Lyttleton of Princeton.

Ionized titanium gas was discovered in interstellar space by Dr. Walter S. Adams and Dr. Theodore Dunham, Mt. Wilson Observatory.

A method for rapid measurement of the velocities of faint stars was developed by Dr. B. J. Bok and Dr. S. W. McCuskey, Harvard.

The bright northern star, Gamma Cassiopeiae, displayed an outburst of light on Oct. 5.

Discovery of a giant red nebula around Antares through use of a Schmidt camera at McDonald Observatory, Texas, by Drs. Otto Struve, C. T. Elvey and F. E. Roach showed that nebulae shine by light reflected from a nearby star.

Stars shining through the Orion nebula were photographed in red light by Dr. Walter Baade, Mt. Wilson Observatory, permitting a measure of the size of dust particles composing the nebula.

The "coldest" stars yet discovered were found by Dr. Charles Hetzler, Yerkes Observatory, through use of new infrared or heat sensitive photographic plates.

Three planetary nebulae in the Milky Way were discovered by Mrs. Muriel M. Seyfert, Harvard Observatory.

Either the universe is unexpectedly small or astronomy is confronted with a new principle of nature which leaves the question of size undetermined, Dr. Edwin Hubble, Mt. Wilson Observatory, concluded from a study of the red shift of spectral lines of extra-galactic nebulae.

The maximum age of the universe is twenty billion years as estimated by Dr. Bart J. Bok, Harvard Observatory, but probably it is much younger.

A perpetual interchange of energy be-

tween light rays and stars was suggested by Prof. Arthur Haas, Viennese physicist, as accounting for the seemingly endless store of energy in the stars.

An unprecedented number of novae or "new stars" were observed: Nova Lacertae sighted in June; Nova Sagittarii found in October; and two Novae Aquilae, one discovered in September and the other in October. Nova Herculis, discovered 1934, continued bright. Two super-novae, extraordinary explosions in distant galaxies, were seen; one in nebulae of the Virgo cluster by Mt. Wilson Observatory, another in a southern galaxy on Harvard photograph studied by Dr. W. J. Luyten, University of Minnesota.

A new minor planet, discovered in February by Prof. E. Delporte of Belgium, and christened Adonis, is smallest object in astronomy's annals except meteorites and came closer to earth than any other heavenly object, except possibly one or two comets.

A new member of the family of Trojan planets was discovered by Dr. K. Reinmuth at the Heidelberg Observatory.

A comet discovered by Leslie C. Peltier of Ohio achieved naked eye brilliance, while other comets discovered were Kaho's comet, Jackson's comet in Aquarius.

Sudden changes in radio transmission were linked to simultaneous changes in terrestrial magnetism, earth currents, and ionosphere ionization, and the cause found in simultaneous solar eruptions, in a world-wide study of radio fadeouts by Dr. J. H. Dellinger, National Bureau of Standards.

The 200-inch glass disk for the world's largest telescope finished cooling at Corning, N. Y., and was shipped to Pasadena, Calif., for shaping of the reflecting surface.

The new observatory on Mt. Palomar, Calif., was begun, with construction of building for the 200-inch telescope, establishment of two-way radio telephone link with Pasadena, construction of an airport, and taking of astronomical photographs with a pilot telescope.

A two-and-half-ton battery of three star cameras began to photograph the Milky Way at the Wynnewood, Pa., observatory.

A process of evaporating aluminum upon telescope mirrors was developed by Drs. John Strong and E. Gaviola, California Institute of Technology, to replace costly and lengthy grinding now necessary in shaping such mirrors.

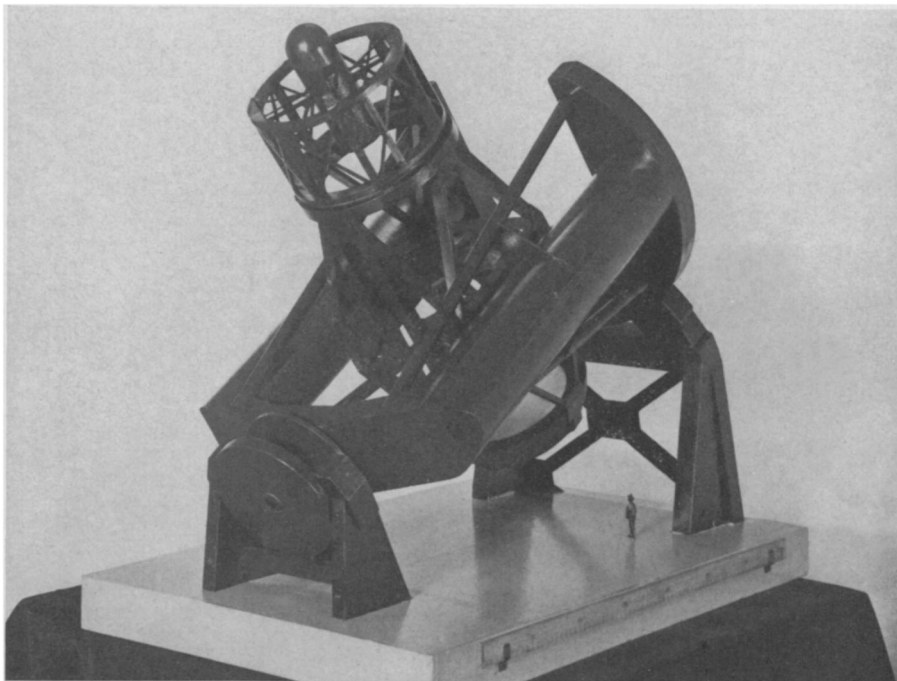
A guiding mechanism for telescopes using photoelectric cell and amplifiers to detect and amplify star light a billion billion times was devised by Drs. A. E. Whitford and G. E. Kron of Washburn Observatory, University of Wisconsin.

Biology

First stages in embryonic development of rabbit ova were started by treatment of unfertilized ova with chemicals and heat, in the laboratory of Dr. Gregory Pincus, Harvard University.

Fruits without seeds were formed by unpollinated flowers when growth-promoting acids were applied to their ovaries, in experiments by Dr. Felix G. Gustafson of the University of Michigan.

Dr. Ross G. Harrison of Yale University showed that the polarity of protein molecules brings about proper relation-



GREAT INSTRUMENT

A model of the 200-inch telescope, made by the California Institute of Technology and displayed at The Franklin Institute, Philadelphia. The small figure of a man on the base gives an idea of the scale of the model, which is 3/8" to the foot.

ship of various parts of the animal body during early embryonic development.

Production of a genuine unicorn bull, through transplanting the horn buds to the center of the head, was announced by Dr. W. Franklin Dove, University of Maine.

Transplanted salamander hearts lived and continued beating, in experiments by Drs. W. H. Wright and H. H. Collins, University of Pittsburgh.

Successful transplantation of a leg from one white rat to another was accomplished by Dr. J. V. Schwind, Loyola University School of Medicine, Chicago.

Foreleg bones of rats grew in the animals' brains, when transplanted in embryo stage by Dr. R. A. Willis, Alfred Hospital, Melbourne, Australia.

Elaborate apparatus for rearing animals and plants totally free of any kind of microorganisms was perfected at Notre Dame University by Prof. J. A. Reyniers.

Surgical transplantation of eyes, ovaries, and other organs in insects only a sixth of an inch long was described by Drs. Boris Ephrussi and G. W. Beadle, working first in Paris and then at the California Institute of Technology.

That cells "drink" fluid from their surroundings was demonstrated by Dr. Warren H. Lewis, Department of Embryology, Carnegie Institution of Washington.

A pressed specimen of one of Gregor Mendel's famous pea plants was brought to the University of Pennsylvania from Mendel's old monastery, by Prof. Samuel W. Fernberger.

The historic Lacasta-Mocino botanical collection was brought from Madrid to the Field Museum of Natural History, Chicago.

Elephants have a body temperature about two degrees lower than that of man, and a heart-beat less than half as fast as the human rate, it was announced by Dr. Francis G. Benedict and Robert C. Lee, Nutrition Laboratory, Carnegie Institution of Washington.

Evolutionary changes in a fungus were produced by secondary cosmic rays, in experiments by Drs. B. Rajewsky, A. Krebs, and H. Zickler of Frankfurt-am-Main, Germany.

Heavy hydrogen and isotopes of other nutrient elements were used in tracing the transportation routes of materials in animal and plant bodies by Prof. August Krogh of the University of Copenhagen and by Drs. R. Schoenheimer and D. Rittenberg of Columbia University.

Cancer-provoking chemicals produced abnormal growths on plants, in experiments by Dr. Michael Levine, Montefiore Hospital, New York City.

Green light is poisonous to one-celled plants, Dr. Florence E. Meier, Smithsonian Institution, discovered.

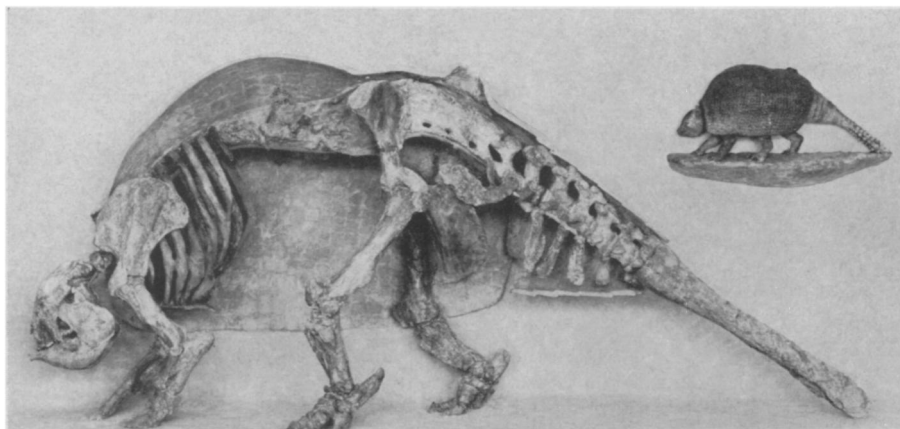
A humane trap, that holds its catch with a chain loop instead of steel jaws, was brought out by Vernon Bailey, formerly of the U. S. Biological Survey.

The North American Wildlife Conference was formed, under the leadership of J. N. ("Ding") Darling.

All shooting of canvasback and red-head ducks was forbidden.

A juniper in the High Sierra, believed to be as old as the famous Big Trees, was studied and described by Dr. Waldo S. Glock, Carnegie Institution of Washington.

An enormous mountain laurel bush, 82 inches through at the base, was found in



MECHANISM OF A LIVING TANK

The Field Museum of Natural History, in Chicago, has a unique new exhibit, in the half-shell of an extinct giant armadillo, or glyptodont, with the animal's skeleton mounted inside to show how the "works" were assembled in life. The slow-moving beast, 8 feet 6 inches long and 3 feet 6 inches high, cased in its armor of bony plates and with a thick helmet protecting its head, was a living prototype of the whippet type war tank to look at, but probably unaggressive and harmless unless attacked. Then the thick, club-like tail, powerfully muscled at the base, would "crack down" on the molester—probably with telling effect even on the great saber-toothed cats that then roamed the earth, seeking what they might devour.

the Great Smoky Mountains National Park.

The great National Park in the Belgian Congo was more than doubled in size.

The number of plant patents passed 200.

Extensive field tests were made with the Rust cotton picker, and an improved model was patented.

A promising new cotton hybrid with exceedingly fine, strong fibers, was announced by the U. S. Department of Agriculture.

Drought caused the worst crop failures in the history of the country.

Grasshoppers and Mormon crickets were very destructive in the West.

The devastating elm disease continued to spread in the area around New York City.

Milk was successfully shipped for long distances by first concentrating and then freezing it, in a process developed by the U. S. Department of Agriculture.

Experiments on a commercial scale were made with the method of growing large crops of vegetables and flowers in tanks of electrically warmed nutrient solution originated by Prof. William Gericke of the University of California.

Chemistry

Artificial production by chemical methods of beri-beri-preventing vitamin B₁ was achieved by Dr. R. R. Williams and associates at Columbia University and the Bell Telephone Laboratories and Dr. J. K. Kline of Merck and Co.

A process for preserving milk for several months by packing it under pressure with oxygen and shipping it refrigerated was developed by the German inventor Theodor Hofius.

For the first time a chemical compound which contains an enzyme as one of its

components was discovered by Dr. Kurt G. Stern of Yale.

Enzymes, the highly complex proteins that make digestion, body oxidations and other physiological processes possible, can be formed out of inactive proteins by suitable chemical changes and heating, reported Dr. J. H. Northrop, the Rockefeller Institute for Medical Research.

A synthetic substitute for wool was developed by Italian chemists from the casein found in milk but tests in other countries indicate that the material lacks the strength and stretching characteristics of the natural material.

The first power alcohol plant in America started operations at Atchison, Kans., under the sponsorship of the Chemical Foundation and is producing ethyl alcohol for blending with gasoline as a motor fuel.

An experimental plant for making oil and gasoline from coal by the Bergius process was operated by the U. S. Bureau of Mines at Pittsburgh.

The oxygen in the air man breathes is heavier than the oxygen in the water he drinks by six parts in a million, it was shown by experiments of Dr. Malcolm Dole, Northwestern University.

The goal of military chemists for years was achieved by the invention of a smokeless as well as flashless powder by the E. I. du Pont de Nemour's chemist, R. G. Woodbridge of Wilmington, Del.

A chemical derivative of corn product wastes yields an explosive known as hexanitroinositol which is more powerful than nitroglycerin, reported Prof. Edward Bartow, president of the American Chemical Society.

With tung oil chemists are now producing a "pre-shrunk" paint which has improved weathering properties, reported M. F. Taggart, South Bend chemist.

Mowing cotton like hay and digesting it chemically—rather than picking it in the present fashion—was advocated at the

Dearborn Farm Chemurgic Conference by Prof. Frank K. Cameron of the University of North Carolina.

By passing sea water through tubes of a synthetic resin made from formalin and tannic acid, English chemists at Teddington converted it into fresh water.

A "waxing" process for bituminous coal which decreases its dirtiness was reported by the Mellon Institute for Industrial Research chemists, Dr. H. R. Fife and P. W. Edeburn.

Phthalic acid was combined with paints to reduce the action of ultraviolet light upon them.

A powerful antiseptic made from oat hulls was developed by Drs. N. M. Phatak and C. D. Leake, University of California Medical School.

A fertilizer has been produced from paper mill wastes by the Department of Agriculture chemists Dr. M. Phillips, M. J. Goss, B. E. Brown and F. R. Reid.

Earth Sciences

The year was one of violent climatic contrasts: The Midwest and Northwest suffered from the coldest and snowiest winter on record, followed by the hottest summer and the worst drought; destructive floods visited the East and South.

The U. S. Coast and Geodetic Survey and the Jesuit Seismological Association investigated twenty-four earthquakes on which observatories in the United States, Canada, and the Philippines transmitted data through Science Service.

Discovery of several great submarine canyons off the Atlantic and Gulf coasts was reported by Prof. Francis P. Shepard, University of Illinois.

Dr. C. S. Piggot of the Carnegie Institution of Washington perfected a "bottom sampler" for bringing up cores of ocean bottom material from great depths.

Quantitative treatment of convection in the interior of the earth was initiated by Dr. C. L. Pekeris.

The U. S. Submarine Barracuda carried an expedition into the Caribbean to measure gravitational anomalies.

A new method for determining age of rocks by their helium content was announced by Dr. William D. Urry, Massachusetts Institute of Technology.

Critical measurements of electrical resistance of various rock formations were made by R. H. Card, American Telephone and Telegraph Company.

Electrical prospecting methods were introduced in the anthracite mining region.

First dinosaur fossils ever discovered in California were found by a high school student, Allan Bennisson, and were collected and studied by C. J. Hesse and S. P. Welles, University of California.

Fossil remains of a dragonfly nearly 2½ feet long were found in the Permian of Kansas by Dr. Frank M. Carpenter, Harvard Museum of Comparative Zoology.

A "missing link" of the tapir family is represented by fossils found in Wyoming and reported on by Dr. Erich Maren Schlaikjer, Brooklyn College.

A fossil fish head nearly six feet long, found near Cleveland, was mounted and placed on exhibition at the Cleveland Museum.

A full-size relief model of a Baluchitherium, largest land mammal that ever

lived, was prepared at the American Museum of Natural History.

Notable fossil finds were reported from Arizona by the National Park Service, from Texas by the University of California, from Georgia by the Georgia State Geological Survey, from Wyoming by Princeton University and the University of Wyoming, and from interior Asia by the Institute of Evolutional Morphology and Paleozoology of Moscow, U.S.S.R.

The U. S. Weather Bureau undertook a systematic examination of all proposed methods of long-range forecasting.

The U. S. Weather Bureau arranged to test air movements during hurricanes, by launching large numbers of sounding balloons in the hurricane area in the South.

A laboratory in which winter weather can be artificially produced was established in the U.S.S.R.

As winter closed in, renewed drought and dust storms in the West again became menacing.

Engineering

Boulder Dam and its accompanying power project on the Colorado River in Nevada was completed and the first power was transmitted to Los Angeles on Oct. 9.

The \$77,000,000 bridge over San Francisco Bay connecting Oakland and San Francisco was opened to traffic.

Giant Triborough Bridge in New York City, over the East and Harlem Rivers, with its 17½ miles of steel and concrete, was completed and traffic flowed over it between Manhattan, Queens and the Bronx.

The longest tunnel of its bore in the world (18 miles long and 16 feet in diameter) was "holed through" at Indio, Calif., as the final construction of the East Coachella Tube was approached and the prospect of supplying Los Angeles with water from across the southern California desert neared reality.

The new vehicular tunnel, 7,380 feet long, under the Hudson River between West 38th Street and Weehawken, was "holed through."

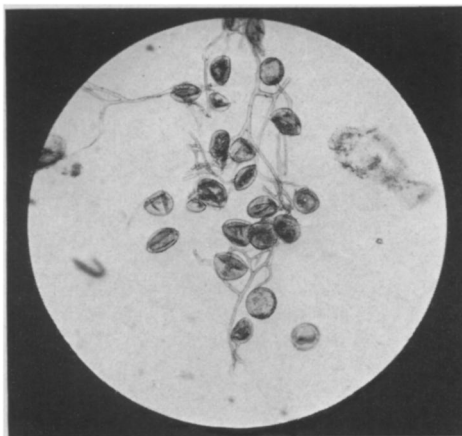
Construction was begun on a new vehicular tunnel under the East River, New York City, connecting Manhattan and Queens boroughs.

Synchronized foghorn and radio signals were installed by the U. S. Lighthouse Service to provide marine navigation with a means of determining a ship's distance, as well as direction, from the lighthouse or lightship.

Prof. Albert Einstein, in cooperation with Dr. Gustav Bucky of New York City, received a patent for a camera which automatically fixes, by use of a photoelectric cell, the proper amount of light to be used in taking a photograph.

A high speed centrifuge in which forces equivalent to 250,000 times the force of gravity can be generated was installed by the laboratories of the du Pont Experimental Station in Wilmington, Del., for use in studying molecular solutions.

Featured by Research Parade showing the new achievements of applied and pure science, addresses on the past, present and future of the patent system, and a "patented" banquet at which every food and drink was a patented product, the Cen-



WHAT IS IT?

A real paleontological puzzle has been turned up in collection of plant remains of Ice Age date found in two places in northern Minnesota. It is evidently the remains of a microscopic plant of some kind, but Prof. C. O. Rosendahl of the University of Minnesota, who discovered the strange object, has stumped all his colleagues who have tried to identify it. It consists of a branching web of fine threads with larger round objects, possibly spore-cases, attached. The round things are about 65 microns in diameter—roughly one two-hundredth as big as the head of a pin. Maybe it is a mold-like fungus; maybe an alga. But nobody seems to know.

ennial Celebration of the American Patent System was held in Washington, November 23, 1936.

Construction was begun on the grounds for the World's Fair to be held in New York City in 1939.

Direct trans-Atlantic telephone service between the United States and France was opened.

Developments in television during 1936 included: public demonstrations of the Radio Corporation of America and Philco systems; increasing the number of lines in image to 441 for better definition; an improved viewing screen made of synthetic crystals and an improved vacuum tube without a filament.

By the use of quartz crystals a sorting system was developed by the Bell Telephone Laboratories which separates into their respective channels the scores of telephone messages that travel along a single telephone wire simultaneously.

Over 30,000 samples of wire of all varieties were placed throughout the nation in corrosion studies of the American Society of Testing Materials.

By use of a slowly revolving stage a three dimensional perspective effect was obtained in photographing animated cartoon characters in the laboratories of the Fleischer Studios, New York City.

A completely electrified farm near Washington, D. C., was opened for public inspection in connection with the World Power Conference held there on Sept. 7.

The new facsimile communication system of the Radio Corporation of America

which can transmit messages at the rate of 12,000 words a minute was demonstrated.

An all glass engine cylinder, only one of its kind in the world, was demonstrated at the Langley Field laboratories of the National Advisory Committee for Aeronautics where it is used to study the distribution of intake and exhaust of fuel and gases.

The use of high speed motion pictures to study the explosions inside cylinders of motor car engines was adopted by the General Motors Corporation.

Values of the viscosity of water and superheated steam at a great range of temperatures resulted from investigations at Purdue University under the direction of a special research committee of the American Society of Mechanical Engineers and with the cooperation of industries, utilities and the Engineering Foundation.

Rubber properties were applied to laminated safety glass by the use of a transparent plastic resin material with flexible qualities known as Acryloid.

Using solar power, Dr. Charles G. Abbot of Smithsonian Institution in Washington operated a small steam engine.

By special processing, marble was made translucent for decorative purposes by Mellon Institute for Industrial Research scientists.

The German Joosten process of soil solidification, in which chemicals injected into sandy soil turn it to a solid rock-like mass with the texture of medium hard sandstone, was under experimental test in the United States.

Fireproof cement-coated shingles were developed by scientists of the Bakelite Building Products, Inc.

A portable scale testing unit which will check motor truck loads up to 38,000 pounds was developed by National Bureau of Standards scientists.

Glass cooking utensils for use directly over open flames were developed by scientists of the Corning Glass Works.

A new type of automobile spring suspension wherein air bellows replace steel was announced by R. W. Brown of the Firestone Tire and Rubber Company.

A new radio system for aircraft which receives two different messages on the same frequency was announced by the Bureau of Air Commerce, Washington.

The S. S. Queen Mary began service across the Atlantic and on August 24, 1936, set a speed record with a crossing from Cherbourg Breakwater to Ambrose Light in four days, seven hours and 12 minutes at an average speed of 30.1 knots.

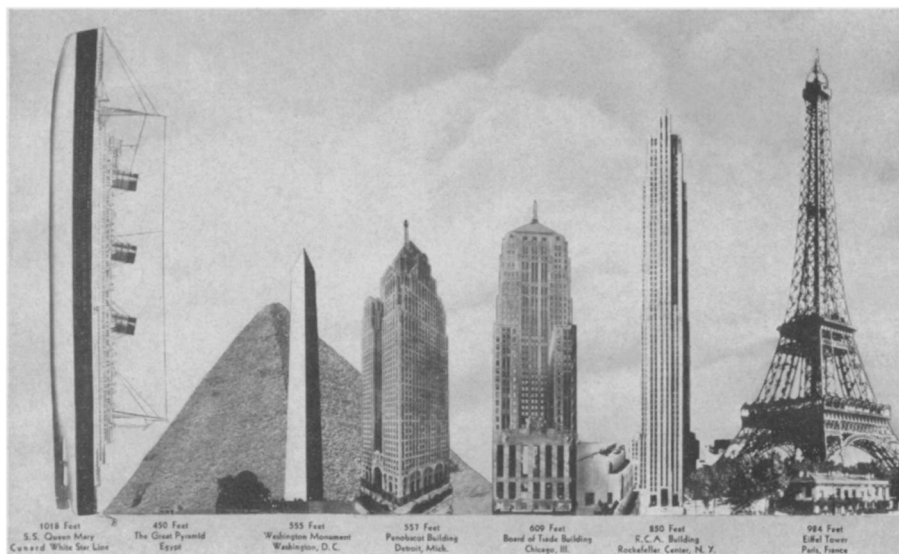
Using local clay, scientists at Tennessee Valley Authority laid the foundations of a ceramic industry in the South and applied electrically-heated kilns to pottery-making for the first time.

Cotton roads, wherein cotton sheeting acts as the binder between the base and top surface, came into use and more than 500 miles of such highway were constructed during the year.

A new high speed type of rifle bullet shaped roughly like the nipple on a baby's nursing bottle was invented by Capt. Wiley T. Moore of the Springfield Arsenal.

Giant hinges of concrete for use in bridge construction were developed at the University of Illinois.

Sticky, raw waste liquids in rayon man-



QUEEN MARY

The length of this new ship is here compared with some of the world's most famous high structures.

ufacture were used as a binding material in surfacing secondary roads by the State of Washington.

A simple process whereby permanent colors can be produced on a wide variety of metals was announced by Dr. J. E. Stareck and Prof. Robert Taft of the University of Kansas.

The development and general use by newspapers of improved portable telephotographic apparatus whereby photographs can be transmitted without physical connection, over any telephone instrument anywhere.

A mechanical calculating machine capable of solving nine simultaneous linear algebraic equations has been completed at the Massachusetts Institute of Technology. Designed by Dr. John B. Wilbur, the simultaneous calculator has wide uses in civil engineering, nuclear physics, genetics, and psychology.

Chemical seasoning of certain species of wood, the improvement of plywoods, manufacture of plastics from lignin, and many other contributions to the wider use of wood were made by the U. S. Forest Products Laboratory, Madison, Wis.

A turbine generator, built for the Appalachian Electric Power Company by General Electric, uses hydrogen as the cooling medium and operates at a steam pressure of 1,250 pounds.

Grand Coulee engineers, faced with a river of muck that threatened to delay construction of the dam, ingeniously froze the flow into immobility. This ice dam saved \$100,000.

Installation of the new coaxial telephone cable which can handle 240 simultaneous telephone conversations on a single wire was completed between New York and Philadelphia.

Medical Sciences

Protamine insulin, called the "most valuable discovery in the treatment of dia-

betes since the original discovery of insulin" was developed, for use together with ordinary insulin in treating severe diabetes, by Dr. H. C. Hagedorn and associates at Steno Memorial Hospital, Copenhagen.

Apparently one disease was transformed into another when Dr. George Packer Berry, University of Rochester School of Medicine, produced in rabbits fatal cases of the tumor disease, myxoma, by injections of killed and harmless myxoma virus mixed with the virus of non-fatal rabbit fibroma.

First synthesis of theelin, one of the female sex hormones, was reported by Prof. Russell E. Marker and Thomas S. Oakwood, Pennsylvania State College.

Apparently successful use of a preparation, known as Protosil, in the treatment of beta hemolytic streptococcus infections including scarlet fever, puerperal fever and erysipelas, was reported by Drs. Perrin H. Long and Eleanor A. Bliss, Johns Hopkins Medical School, and in England by Dr. Leonard Colebrook, Medical Research Council, and Dr. Méave Kenny and associates, Queen Charlotte's Hospital, London. The chemical was first prepared and used in Germany four years ago.

Continuous use of the stomach tube to reduce internal pressure in the distended abdomen in cases of acute intestinal obstruction and other severe abdominal conditions was devised and its successful use reported by Dr. Owen H. Wangenstein of Minneapolis, Minn.

Long-sought cause of mussel poisoning, which has resulted in death following the eating of California rock mussels at certain seasons, was traced by scientists at the Hooper Foundation of the University of California to poisonous phosphorescent microorganisms of the sea, *Gonyaulax catenella*, eaten by the mussels.

Detection of radium poisoning became more accurate through the application of a new type of screen-cathode quantum counter developed by Dr. Robley D. Evans,

Massachusetts Institute of Technology, and said to be 10 to 100 times more sensitive than older methods of detecting radium in the body.

Better protection against dangerous X-ray burns through use of a baffle screen which deflects secondary electrons in the X-ray beam was devised by Dr. G. Failla, Memorial Hospital, New York.

A new technique for investigating living matter by obtaining characteristic electrical patterns specific for each species and which, in animals, has already shown characteristic changes in the pattern on the advent of cancer, during ovulation, and other physiological processes was devised by Drs. Harold S. Burr, Cecil T. Lane, and Leslie F. Nims of Yale University.

Neutron rays are more effective than X-rays in killing tumors in animals and may prove more potent in destruction of cancers in humans, Dr. John H. Lawrence of Yale University and his brother, Prof. Ernest O. Lawrence of the University of California, reported, on the basis of studies with the atom-smashing cyclotron invented by Prof. Ernest O. Lawrence.

Growth of mouse cancers was checked with hemorrhage and destruction of the tumors following treatment with colon bacilli, meningococci and other microorganisms, Dr. H. B. Andervont, U. S. Public Health Service, reported.

Mice with spontaneous tumors lived longer and tumor growth was checked following injections of cystine disulfide, Dr. Frederick S. Hammett, Lankenau Hospital, Philadelphia, reported.

Cancer tissue, contrary to general opinion, requires the same sort of protein nourishment for its growth as normal tissue, Drs. Carl Voegtlin, J. W. Thompson, Mary E. Maver and J. M. Johnson, U. S. National Institute of Health, found from experiments in which growth of cancer in mice was checked by diets deficient in lysine or cystine and restimulated by glutathione.

A new strain of yellow fever virus was isolated by scientists of the International Health Division, Rockefeller Foundation, promising more effective vaccination against yellow fever.

A new hazard from yellow fever was discovered when scientists of the Rockefeller Foundation's International Health Division found that Brazilian jungle fever is yellow fever and that other mosquitoes besides *Aedes aegypti* can carry the disease.

A chemical explanation of heart failure as a disturbance in the breaking down and rebuilding by individual heart muscle cells of phosphocreatine was worked out by Drs. George Herrmann and George Decherd, University of Texas School of Medicine.

Visual purple, chemical compound in the eye necessary for seeing, was regenerated in a test tube for the first time under controlled conditions which make possible repetition of the feat and consequent important investigations of vision, by Drs. Selig Hecht, Aurin M. Chase, Simon Shlaer and Charles Haig at Columbia University.

A test for sense of smell and for fatigue of this sense, which may be useful in locating brain tumors, was developed by Drs. Charles A. Elsberg, Irwin Levy and

Earl D. Brewer at the Neurological Institute, Columbia University.

A nervous mechanism that acts as a thermostat to regulate body temperature was found in the hypothalamic region of the brain by Dr. S. W. Ranson, Northwestern University Medical School.

Important function of the cortex of the adrenal glands is to regulate the amount of potassium in the blood and thus keep the body from poisoning itself, Drs. Raymond L. Zwemer and Richard Truszkowski, Columbia University College of Physicians and Surgeons, reported.

Once-fatal Addison's disease, due to injury or disease of the adrenal glands, may be successfully treated without the use of cortical hormone by giving a diet low in potassium and containing proper amounts of salt and sodium citrate, members of the staff of the Mayo Clinic found.

Successful transplantation of adrenal gland tissue from a woman suffering from virilism to a man suffering with Addison's disease restored the man's health and prolonged his life, Dr. Max A. Goldzieher, New York City, and associates reported.

First operation on the pituitary gland to refeminize a "bearded lady," with successful results lasting one year, was reported by Dr. H. Lisser, University of California Medical School.

Apparent cure by X-ray treatment of two cases of the rare disease, pituitary basophilism, caused by tumor of the pituitary gland, with restoration of the patients' health and transformation of their personalities, was reported by Dr. Merrill C. Sosman, Peter Bent Brigham Hospital, Boston.

Further evidence that the adrenal and pituitary glands play an important role in diabetes was obtained by Dr. C. N. H. Long, Yale University.

The relation of the pituitary gland to sex functions was further clarified by Dr. Herbert M. Evans and collaborators at the University of California who succeeded in separating the stimulating extract into three fractions, each of which selectively affects one of the three functional components of the ovary.

Lipocaic, new hormone from the pancreas which controls fat metabolism in the liver as insulin controls carbohydrate metabolism and may greatly improve treatment of diabetes, was obtained by Drs. Lester R. Dragstedt, John van Prohaska and Herman P. Harms, University of Chicago.

Vaccination against ivy poison by subcutaneous injections of the irritant from poison ivy plants was accomplished in a group of CCC men by Lieutenant-Colonel J. M. Blank, U. S. Medical Reserve Corps, and Dr. Arthur F. Coca, Pearl River, N. Y.

Influenza can be more widely spread through the air than previously supposed, but ultraviolet light kills the influenza virus suspended in droplets in the air, studies by Drs. W. F. Wells and H. W. Brown, Harvard School of Public Health, indicated.

Ultraviolet light sterilization of the air in operating rooms was introduced as a means of successfully reducing infections of surgical wounds by Dr. Deryl Hart, surgeon-in-chief at Duke Hospital, Durham, N. C.

A structure between the nerves and muscles of the body which acts as a barrier to the passage of a disease-causing virus which, like infantile paralysis virus, attacks the brain and central nervous system, was discovered by Drs. Albert B. Sabin and Peter K. Olitsky, Rockefeller Institute for Medical Research.

An alum-picric acid nasal spray, developed by Dr. Charles Armstrong, U. S. National Institute of Health, was widely used as a preventive of infantile paralysis in southern states. This method was 95 per cent effective in monkeys but the method of its employment in the southern states was such as to leave its value in humans undetermined.

Successful use of placental extract in the treatment of hemophilia was reported by Drs. R. Canon Eley and Charles F. McKhann of Boston.

Surgical operations were performed on hemophiliacs without post-operative hemorrhage by means of high frequency electroscalpel and coagulation unit, Drs. Warfield M. Firor and Barnes Woodhall, Johns Hopkins Hospital, reported.

Incubation of egg white mixed with potassium bromide provides a remedy that markedly reduces the blood clotting time in hemophiliacs and continued use of the remedy may enable them to lead normal lives without danger of hemorrhage from slight injury or exertion, Drs. W. A. Timperley, A. E. Naish and G. A. Clark, University of Sheffield, England, reported.

Improved rabies vaccine, free from potentially dangerous nervous tissue, was made from culture virus by Drs. Leslie T. Webster and Anna D. Clow, Rockefeller Institute.

Picrotoxin is an antidote for overdoses of luminal and other barbiturates, Drs. T. Koppányi, J. M. Dille and C. R. Linegar, Georgetown University Medical School, reported.

Antidote for cyanide poisoning is injection of a mixture of amyl nitrate, sodium nitrite and sodium thiosulphate, Dr. K. K. Chen of Indianapolis reported.

The immediate cause of certain headaches was claimed by Dr. Temple Fay, Temple University, Philadelphia, to be the amount of fluid in the brain.

Epileptic seizures were predicted by electrical studies of the brain conducted by Drs. F. A. Gibbs and W. G. Lennox, Harvard Medical School.

Experimental production of edema of the lungs and subsequent pneumonia, such as occurs following operations, burns and toxic conditions of childbirth, was accomplished by Drs. Virgil H. Moon and David R. Morgan of Philadelphia.

Human bone marrow was grown in glass laboratory apparatus for the first time in sufficient quantities for study of blood and metabolism by a method devised by Dr. Edwin E. Osgood and Alfred N. Muscovitz, University of Oregon Medical School.

Injecting meningococcus antitoxin into the veins instead of the spinal cavity is a more effective method of treating epidemic meningitis and reduces the number of deaths from the disease, Dr. Archibald L. Hoyne of Chicago found.

Allergy or sensitiveness to certain foods can be detected by a blood test, since the number of white blood cells decreases after the offending food is eaten, Dr. Warren

T. Vaughan, Richmond, Virginia, reported.

Further proof that food poisoning is due to *Staphylococcus aureus*, common microorganism that also causes boils, and that cream puffs and eclairs, foods most commonly concerned, can be made safe by reheating to 156 degrees Fahrenheit, was furnished by researches of Dr. G. M. Dack of the University of Chicago and Dr. George A. Denison of Jefferson Co., Ala., Board of Health.

The causative virus of epidemic encephalitis was grown outside the animal body by Drs. Jerome T. Syverton and George P. Berry, University of Rochester School of Medicine and Dentistry.

A combination of recognized fever and medicinal methods of treating syphilis, which materially shortens the necessary period of treatment, was reported by Drs. Clarence A. Neymann and Theodore K. Lawless and S. L. Osborne of Chicago.

Sinus infections can reach the lungs via lymphatic glands of neck and chest, Drs. Ralph A. Fenton and Olaf Larsell, University of Oregon Medical School, demonstrated.

Test for predicting the outcome of operations for relief of high blood pressure, made by observing the effect on blood pressure of injection of the anesthetic, sodium pentothal, was devised by Drs. Edgar V. Allen, J. S. Lundy and A. W. Adson of the Mayo Clinic.

Use of blood from the newly dead for transfusion to living persons was undertaken at the Central Emergency Hospital, Moscow, and results in nearly 1,000 cases were reported by Dr. S. S. Yudin, surgeon-in-chief.

Derivatives of morphine that are safer and more powerful than ordinary morphine were prepared by Dr. Lyndon F. Small, University of Virginia, in research directed toward development of non-habit-forming morphine. Addiction property of the new morphines has not yet been determined.

A method of preventing tooth decay by using silver nitrate to detect faults in enamel formation where decay may start was reported by Dr. E. P. Brady, Washington University Dental School.

A new alcohol, phtiocerol, isolated from the wax of the human tubercle bacillus, was reported by Prof. R. J. Anderson and S. H. Stodola, Yale University, in addition to two other new alcohols, entirely different in composition from phtiocerol, isolated one each from the timothy bacillus and the leprosy bacillus.

Medical use of vitamin B₂ may be safer as a result of studies of flavin compounds related to the vitamin which showed a chemical method of reducing the toxicity of the vitamin tremendously in the animals tested; the studies were made by Drs. Richard Kuhn and Paul Boulanger, Kaiser Wilhelm Institute.

Five wavelengths comprise the portion of ultraviolet light curative of experimental rickets by irradiation, and of these the one which is most effective rarely reaches the earth in sunshine, Prof. John W. M. Bunker and Dr. Robert S. Harris, Massachusetts Institute of Technology, reported.

A method for rapid intubation of the human small intestine, developed in the medical clinic of the University of Pennsylvania, permitted the collection of pure

intestinal secretion, a determination of its chemical characteristics, a study of the motor effects of morphine on the intestinal musculature and a direct investigation of glucose absorption from the bowel.

Physics

One of the fundamental forces of nature—the binding energy between the cores of two hydrogen atoms—was measured by Drs. M. A. Tuve, N. P. Heydenburg and L. R. Hafstad, Carnegie Institution of Washington.

First synthesis of a naturally occurring radioactive element was achieved in atomic bombarding experiments on bismuth by Dr. J. J. Livingood, University of California.

Experimental evidence for the existence of the neutrino was found in research on cadmium, tin, indium and tellurium isotopes by Dr. Kenneth T. Bainbridge, Harvard University.

Particles of 11,000,000 electron-volt energy for use in atomic disintegration experiments were produced by Prof. E. O. Lawrence, University of California.

Measurement of 17 million-volt gamma ray, produced by bombardment of Lithium with protons, was made by cloud chamber observations of pairs produced by Prof. C. C. Lauritsen and his colleagues, California Institute of Technology.

A high efficiency radio oscillating circuit said to have usefulness in television, radiotherapy, extremely high voltage X-rays and for experiments in atomic disintegration was developed by Dr. William Hansen, Stanford University.

Experiments with radio waves only six inches long which travel along hollow tubes were simultaneously announced by Dr. G. C. Southworth, Bell Telephone Laboratories, and Dr. W. L. Barrow, of Massachusetts Institute of Technology.

A long-lived artificial radioactivity of a beryllium-aluminum alloy with a half life of at least 10 years was discovered by Dr. Edwin McMillan, University of California.

The lightest solid ever made by man or found on earth was produced in the form of a light isotope of lithium by Dr. L. H. Rumbaugh, Bartol Research Foundation.

Polaroid, a cheap polarizing transparent material which will eliminate the glare of night driving and also make possible 3-dimensional color motion pictures, was introduced by the Land-Wheelwright Laboratories of Boston.

An obsolete 130,000-pound electro-magnet at Annapolis, Md., was moved to Columbia University for use in experiments on atomic disintegration.

A small but powerful electromagnet which has produced 75,000 gauss and is capable of generating a field strength of 120,000 gauss, was reported by Dr. Francis Bitter, Massachusetts Institute of Technology.

Bearing self-recording electroscopes, small balloons released in cosmic ray experiments of Prof. Robert A. Millikan, California Institute of Technology, set a new altitude record for this type of experiment at 92,000 feet (17½ miles).

The first cosmic ray radio data obtained by small unmanned balloons of cellophane

were reported by Dr. Thomas Johnson, Bartol Research Foundation.

A new experimental check on the Einstein theory of relativity by studying the motions of binary stars was advanced by Prof. Tullio Levi-Civita, University of Rome.

The human skin is more sensitive to small temperature differences than are the most sensitive thermometers, reported Dr. J. D. Hardy and T. W. Oppel, Russell Sage Institute of Pathology and New York Hospital.

Intense audible sounds were made to produce light in 14 different liquids by Dr. L. A. Chambers, University of Pennsylvania Medical School.

A fortress of science, partially underground, in which experiments on atomic disintegration will be performed, was projected by the Carnegie Institution of Washington.

To supply musicians, piano tuners and instrument makers with a standard pitch "A," the National Bureau of Standards broadcast this musical note for two weeks continuously on short wave radio.

A compact 1,000,000-volt electrostatic type generator was installed at Huntington Memorial Hospital, Boston, to produce radiation useful in cancer therapy.

Improved measurements of the magnetic moments of the proton and deuteron were made by Dr. I. I. Rabi of the physics department of Columbia University.

New types of nuclear disintegrations produced by cosmic radiation were discovered through the investigation of Dr. Carl Anderson and Dr. Seth Neddermeyer, California Institute of Technology.

A test for tool-resisting prison bars by use of a small magnetic instrument was developed by R. L. Sanford, National Bureau of Standards.

Seven hours of treatment with intense sounds will age whiskey an amount equivalent to four years in the wood, reported Dr. L. A. Chambers, University of Pennsylvania.

A simple and rugged receiver of infrared radiation was invented by the veteran Boston electrical engineer, Dr. Hammond Vinton Hayes.

A belated scientific finding from the 1935 stratosphere flight of Stevens and Anderson was the announcement that neutrons exist at altitudes of 12 miles, in a report by Drs. L. H. Rumbaugh and G. L. Locher, of Franklin Institute's Bartol Research Foundation.

First rigorous proof of an extension of the long-puzzling "Waring problem" in mathematics was reported by Prof. L. E. Dickson, University of Chicago.

New value for the charge on the electron (4.800×10^{-10}) electrostatic units was announced by Kelletrop of Upsala on the basis of improved oil drop technique, and agreeing within one part in 5,000 of the best value obtained by X-ray measurements.

First complete X-ray analysis of the atomic arrangement of an amorphous substance (glass) was obtained by Prof. Bertram Warren of Massachusetts Institute of Technology.

An absorption spectroscopy capable of measuring a concentration of 1/10,000 of one per cent of carbon dioxide in air was

developed for plant growth researches by Dr. E. D. McAlister of the Smithsonian Institution.

Psychology and Psychiatry

A new tool for study of the mentally ill was suggested by Dr. T. W. Forbes, New York State Psychiatric Institute, by the discovery that the psychogalvanometer, or "lie detector," can distinguish two electric waves from the skin, one of which betrays excitement in the subject even when he is unaware of feeling it.

Learning may be observed at the moment it takes place, indirectly through observation of the brain's electric potential during the process, Dr. Herbert H. Jasper, Brown University, found.

Use of the rhythmic electric impulses from the brain to locate defective areas in that organ was reported by Drs. H. H. Jasper and H. L. Andrews, Brown University.

A progressive increase in rate of human brain waves from about four and a half per second in the baby 3 months old to the adult rate of 10 or 11 per second in the 12-year-old, suggesting a parallel development of brain function, was reported by Dr. Donald B. Lindsay, Brush Foundation and Western Reserve University.

Brain waves occur in unborn guinea-pigs at least 12 days before normal birth, Drs. Leonard Carmichael, Charles S. Bridgman, University of Rochester, and Dr. H. H. Jasper, Brown University, observed.

Identical twins have identical patterns of brain rhythms, Drs. Hallowell Davis and Pauline A. Davis, Harvard Medical School, found from study of 18 twin pairs.

Brain waves may be used as a mark of distinction between individuals, Drs. Lee Edward Travis and Abraham Gottlober, State University of Iowa, found.

The hypnotic trance is not the same physiologically as natural sleep, electric potentials from human brains under the two conditions demonstrated to Drs. E. Newton Harvey, Princeton, Alfred L. Loomis and Garret Hobart, Loomis Laboratory.

Effects of sedative and other drugs upon the brain are partially revealed by the brain's electric potentials, Dr. W. G. Lennox and Dr. and Mrs. F. A. Gibbs, Harvard University Medical School, found.

Possible use of brain waves as a tool for understanding mental deficiency was suggested by Dr. George Kreezer, Vineland Training School, who found differences in the brain rhythm pattern of Mongolian defectives below six-year mental age.

Injury to the brain cortex causes loss of mental plasticity and also of ability to make a general attack on a problem, this loss being independent of the location of the injury but proportional to its extent, Dr. I. Krechevsky, University of Chicago, learned from animal experiments.

The centers of the brain controlling instincts were located by Prof. E. Grünthal, Würzburg University, Germany, in the part of the brain known as the thalamus and hypothalamus.

The reflex leg movement ordinarily made by a rat startled by a noise can be "forgotten" if the noise is repeated, it was found by Drs. Walter S. Hunter, Brown

University, and C. Ladd Prosser, Clark University, who demonstrated that spinal reflexes can be extinguished and then restored.

Ability of a person to adjust the frequency of a tone until it appears exactly half as high in pitch as another was demonstrated in experiments by Drs. S. S. Stevens and J. Volkman, Harvard University, and Dr. E. B. Newman, Swarthmore College, who built a numerical scale of psychological pitch in this way.

Experimental confirmation of the theory that tones of differing pitch are distinguished because they affect different areas in the ear's basilar membrane was obtained by Drs. Hallowell Davis, S. S. Stevens, and Moses H. Lurie, Harvard University. Dr. Stevens also found that the human ear can act as radio loud speaker, converting electric impulses of a radio receiver into tones readily identified by the "listener."

Decreased sugar in the blood increases acuity of hearing, Dr. W. J. Brogden, University of Illinois, found by X-raying the pituitary glands of dogs and by experiments with a diabetic patient.

Animals are sensitive to temperature before birth, but the sensitivity increases during the fetal period, Dr. Leonard Carmichael, University of Rochester, found from experiments with guinea pigs.

Monkeys have color vision equal to man's, a fact of significance to the theory of evolution, Dr. Walter F. Grether, University of Wisconsin, found.

Refined division of labor in the nervous system was demonstrated by Dr. Karl U. Smith, University of Rochester, when he observed that cats have one type of vision controlled by the visual area of the brain cortex and another dependent upon a more primitive part of the nervous system.

A 14-year-old boy retains some impression of poetry read to him in infancy, it was demonstrated experimentally by Dr. Harold E. Burtt, Ohio State University.

Startle, such as that produced by a revolver shot, causes two distinct types of emotional response—first an instantaneous involuntary and universal reaction and second a more individual socialized behavior—ultra-rapid motion pictures revealed to Dr. William A. Hunt, Connecticut College for Women, and Dr. Carney Landis, Columbia University.

The uncertainty principle of physics, which opposes the concept of determinism, was extended to include psychology by Prof. Niels Bohr, physicist of Copenhagen.

Because of the way doses of glandular secretions change behavior, Dr. Roy G. Hoskins, Harvard University, proposed that "chemical conditioning" should be accepted as a new psychological principle.

Size of a social group has an important effect upon the tendency of an individual to dominate, the weaker one of a pair often becoming dominant in a larger group, Dr. A. H. Maslow, Columbia University, found from study of monkeys.

Chimpanzees can be taught to use gestures and vocalization to solicit aid from another animal in a cooperative task, Dr. Meredith P. Crawford, Yale University, found.

Rudimentary, or undeveloped, speech centers were found in the brains of the three highest apes—orang-utan, gorilla, and chimpanzee, by Dr. Cornelius J. Conolly, Catholic University of America.

Seven primary elements of human intel-

ligence were named by Dr. L. L. Thurstone, University of Chicago, as number facility, word fluency, visualizing ability, memory, perceptual speed, induction, and verbal reasoning.

The functioning of attitudes in human conditioned reactions makes learning thereby a very different process in human beings from what it is in animals, Dr. G. H. S. Razran, Columbia University, concluded.

Capacity for mental work is impaired at an altitude of 17,500 feet, Dr. R. A. McFarland, Columbia University, found as a member of the International High Altitude Expedition to Chile.

A mathematical genius of the lightning calculator sort was produced from an ordinary college student by giving him 75 hours of practice and special training by Drs. Samuel Renshaw, William C. Schwarzbek and Otis D. Knight, Ohio State University.

A scale for measuring social competence, especially useful in testing those suspected of mental deficiency, was developed by Dr. Edgar A. Doll, Training School, Vineland, N. J.

Phenobarbital, a commonly used hypnotic drug, retards learning of rats but does not affect their forgetting, Dr. Griffith W. Williams, University of Rochester, found.

Fever and also increased blood pressure and pulse rate can be produced by suggestion, Dr. M. Kershaw Walsh, University of South Carolina, reported.

Insulin was used in Europe to treat the mental disease schizophrenia, and it is claimed restored patients to sanity.

Disturbance of a part of the brain, the hypothalamus, may be the primary factor in the important mental disease schizophrenia, Drs. Isidore Finkelman and Daniel Haffron, Elgin, Ill., concluded from evidence that the hypothalamus controls oxygen consumption and other body mechanisms which are upset in the mental disease.

A new form of functional nervous disorder attacking only airplane pilots and called therefore aeroneurosis was reported by Dr. Harry G. Armstrong, U. S. Army Medical Corps.

Patients can be brought out of the death-like stupor of schizophrenia by hypodermic injection of brandy, Drs. N. V. Kantorovich and S. K. Constantinovich, Medical Institute and Psychiatric Hospital, Leningrad, reported.

A surgical procedure which blocks off a portion of the impulses to and from the prefrontal lobes of the brain was used successfully to relieve symptoms of chronic mental disease by Drs. Walter Freeman and James Watts, George Washington University Medical School. The operation was first devised by Dr. Egas Moniz of Portugal.

Success with treatment of mental disease patients in groups rather than individually was reported by Drs. Paul Schilder, and Loretta Bender, Bellevue Hospital, New York City.

An individual's manner of breathing is characteristic and may reveal certain emotional and physical derangements and unconscious desires, experiments showed Drs. Leon J. Saul and Franz Alexander, Chicago.

A new Committee for the Study of Suicide was organized in New York.

A new scientific organization, the Society

for Psychological Study of Social Issues, was formed for the purpose of applying psychology to research on problems in the fields of politics, economics, and relations between nations.

Rewards and Recognitions

The Nobel Prize in Physics was awarded jointly to Prof. V. F. Hess, University of Innsbruck, Austria, and Dr. Carl D. Anderson, California Institute of Technology, the former for discovery of cosmic rays and the latter for discovery of a fundamental building-block of matter, the positron.

The Nobel Prize in Chemistry was awarded to Prof. Peter Debye, Kaiser Wilhelm Institute of Physics, Berlin, co-founder of the famous Debye-Huckel theory in physical chemistry which made it possible to calculate exactly the electrical conductivity of a strong electrolytic solution.

The 1936 Nobel Prize in Medicine was awarded jointly to Sir Henry Hallet Dale, director of the National Institute of Medical Research, London, and Dr. Otto Loewi, University of Graz, Austria, for their discoveries related to the chemical transmission of nervous activity.

Pope Pius XI founded a new Pontifical Academy of Sciences with a total membership of 70 eminent scientists of all nations, including the following Americans: Prof. George D. Birkhoff, Harvard University; Dr. Alexis Carrell, Rockefeller Institute for Medical Research; Prof. Robert A. Millikan and Prof. Thomas H. Morgan, California Institute of Technology; Dr. George S. Sperti, Institutum Divi Thomae of the Ohio Athenaeum; Prof. Hugh S. Taylor, Princeton University.

Prof. Roger Adams, University of Illinois, received the 1936 Willard Gibbs Medal of the American Chemical Society, Chicago Section, for his achievements which include synthesis of new local anesthetics, chaulmoogric acid and allied compounds.

Alfred Africano and the American Rocket Society of which he is vice-president were jointly honored by the International Rep-Hirsch Prize of the Astronomical Society of France because of Mr. Africano's engineering formulae and designs for a rocket calculated to ascend seven miles.

Dr. Edward A. Archibald, McGill University, Montreal, was awarded the Trudeau Medal of the National Tuberculosis Association for introducing the life-saving chest operation, thoracoplasty, into America.

Dr. Leo H. Baekeland, inventor of Bakelite, was elected to honorary membership in the Royal Society of Edinburgh.

The Kober Medal for outstanding medical achievement was awarded by the Association of American Physicians to Dr. E. R. Baldwin, Saranac, N. Y., for his work with tuberculosis.

Prof. Marston Taylor Bogert received the medal of the American Institute of Chemists for outstanding service to the science of chemistry.

For his development of automatic machines for solving intricate equations of higher mathematics, Dr. Vannevar Bush, vice-president of the Massachusetts Institute of Technology, was awarded the Lamme Medal of the American Institute of Electrical Engineers.

Prof. William Mansfield Clark, Johns Hopkins University, received the William H. Nichols Medal of the American Chemical Society in recognition of his notable researches on hydrogen ion concentrations and their industrial applications.

The Wm. H. Walker award of the American Institute of Chemical Engineers was given to Dr. Allan P. Colburn, E. I. du Pont de Nemours and Company.

Henry B. Collins, Jr., U. S. National Museum, received a gold medal by the Royal Danish Academy of Sciences and Letters for research on the origin of the Eskimos.

Prof. Edwin Grant Conklin, Princeton University, was elected president of the American Association for the Advancement of Science for 1936.

The Marcellus Hartley Gold Medal for eminence in application of science to the public welfare was awarded by the National Academy of Sciences to Dr. Hugh Smith Cumming, Emeritus Surgeon General, U. S. Public Health Service.

George O. Curme, Jr., received the Elliott Cresson Medal of the Franklin Institute for his work in the field of aliphatic chemistry.

Donald Wills Douglas, designer and builder of airplanes, was selected for the Collier Trophy by a committee of the National Aeronautic Association.

Lincoln Ellsworth was given the Hubbard Medal of the National Geographic Society for "heroic and extraordinary achievements in Arctic and Antarctic exploration."

Dr. James Ewing, Memorial Hospital, New York, was honored with the John Scott Medal of the City of Philadelphia for his research in classifying tumors.

A Royal Medal of the Royal Society of London was awarded to Prof. R. H. Fowler, Cambridge University, for work in statistical mechanics and modern mathematical physics.

The Remington Medal of the American Pharmaceutical Association was awarded to Dr. E. N. Gathercoal of the University of Illinois College of Pharmacy.

Prof. William Francis Giauque, University of California, was awarded the Chandler Medal of Columbia University as recognition of his development of a technique for attaining extremely low temperatures and discovery of three isotopes of oxygen.

Dr. Ludvig Hektoen, director, John McCormick Institute for Infectious Diseases, was selected as chairman of the National Research Council.

The gold medal for the best scientific exhibit at the annual meeting of the American Medical Association was awarded to Drs. Charles B. Huggins, W. J. Noona and B. H. Blocksom, University of Chicago, for their demonstration and discovery that a warm temperature—96 degrees Fahrenheit—is necessary for manufacture of blood by bone marrow and that the low temperature of the extremities is the reason why no blood is formed in the marrow of bones of hands, feet, and lower parts of arms and legs in adults.

Dr. Frank B. Jewett, director of the Bell Telephone Laboratories, was awarded the Franklin Medal of the Franklin Institute in recognition of the many important contributions made to telephony by him and by others associated with him.

George F. Kelly, New York engineer, re-

ceived the John Scott Medal from the City of Philadelphia for invention of a dust trap to protect workers from silicosis.

Dr. Charles F. Kettering, director of the General Motors Research Laboratories, received the Franklin Medal of the Franklin Institute in honor of his "significant and timely contributions to the science of automotive engineering." He was also awarded the John Scott Medal of the City of Philadelphia for invention of the self-starter.

Dr. John Gamble Kirkwood, 29, Cornell University, was given the Award in Pure Chemistry of the American Chemical Society.

The John Phillips Memorial medal of the American College of Physicians was awarded to Dr. Eugene M. Landis, University of Pennsylvania Medical School, for development of a micro-pipette method of investigating the capillaries.

Dr. Walter S. Landis, American Cyanamid Company, was awarded the 1936 Chemical Industry Medal of the Society of Chemical Industry's American Section for his successful attack on various research problems and first large-scale production of argon.

Dr. Andrew C. Lawson, emeritus professor of Mineralogy and Geology, University of California, received the Hayden Memorial Medal of the Academy of Natural Sciences of Philadelphia, awarded for fundamental research in geology.

Dr. George William Lewis, director of aeronautical research of the National Advisory Committee for Aeronautics was awarded the Daniel Guggenheim Medal, aviation award.

Dr. Walter H. McIntire, University of Tennessee, consultant for TVA, received the Charles Herty award of the Georgia State College for Women as "the man who has done outstanding chemical work in the South this year."

Albert L. Marsh received the John Price Wetherill Medal of the Franklin Institute for his research on an electric resistance element.

Dr. George R. Minot, Harvard, received the annual award of the Associated Grocery Manufacturers Association of America for research in nutrition.

The gold medal of the American Institute was awarded to Dr. John C. Merriam, president of the Carnegie Institution of Washington, for his discoveries in paleontology, effective promotion of research and recognition of the place of science in man's affairs.

Andrew W. Mellon was given the Pittsburgh Award of the American Chemical Society, Pittsburgh Section, for his support of chemistry through the Mellon Institute of Industrial Research.

Thomas Midgley, Jr., of Dayton and Detroit, was awarded the 1937 Perkin Medal of the Society of Chemical Industry's American Section for his development of anti-knock motor fuel and fundamental discoveries of non-toxic refrigerants.

Dr. Thomas Hunt Morgan was honored on his 70th birthday by the University of Kentucky which placed a plaque at his birthplace.

Dr. John Howard Northrop, Rockefeller Institute for Medical Research, was awarded the Chandler Medal of Columbia University for fundamental discoveries concerning bacteria, the constitution of protein, and the chemistry of digestion.

Dr. Thomas Parran, formerly Health

Commissioner of New York State, was appointed by President Roosevelt as Surgeon General of the U. S. Public Health Service.

The Public Welfare Medal of the National Academy of Sciences and also the Sedgwick Memorial Medal of the American Public Health Association were awarded to Dr. F. F. Russell, lecturer at Harvard University, in recognition of his work on the etiology of yellow fever and studies of epidemic areas.

Dean Herman Schneider, University of Cincinnati, was honored with the Lamme Medal of the Society for the Promotion of Engineering Education, for his pioneering introduction in 1909 of engineering courses interspersed with actual industrial work.

Capt. Albert W. Stevens and Capt. Orvil A. Anderson, U. S. Army Air Corps, received the Mackay Trophy in honor of their stratosphere flight in the Explorer II.

The Edison Medal of the American Institute of Electrical Engineers was bestowed upon Dr. Lewis B. Stillwell, engineer of the Port of New York Authority.

Ambrose Swasey, telescope maker, received the Hoover medal of the American Society of Mechanical Engineers.

Dr. Arthur Newell Talbot, professor emeritus of engineering, University of Illinois, was awarded the John Fritz Gold Medal for notable scientific or industrial achievement.

The Institute of Radio Engineers awarded the Morris Liebmann Memorial Prize to B. J. Thompson, RCA Tube Laboratory, for research in the field of very high frequencies leading to development of the "acorn" tube.

Dr. Robert J. Van de Graaff, Massachusetts Institute of Technology, was awarded the Elliott Cresson Medal of the Franklin Institute for his development of a high voltage generator.

The National Academy of Sciences awarded the Agassiz Medal for Oceanography to Dr. T. Wayland Vaughan, former director of the Scripps Institution of Oceanography in recognition of his investigations of corals, foraminifera and submarine deposits and for his leadership in developing oceanographic activities on the Pacific Coast of America.

Drs. Ernest Glen Wever and Charles William Bray, Princeton University, were awarded the Howard C. Warren Medal by the Society of Experimental Psychologists for their distinguished research in audition.

Dean Frank C. Whitmore, Pennsylvania State College, was selected for the 1937 Nichols medal of the American Chemical Society's New York Section for his studies of compounds of organic substances with metals and his aliphatic chemical researches dealing with gasoline, ether, and alcohols.

The John J. Carty medal and award of the National Academy of Sciences was awarded to Prof. E. B. Wilson, Columbia University.

Dr. John A. Wilson, young Egyptologist, was honored by appointment as acting director of the Oriental Institute, University of Chicago, to succeed the late Prof. James H. Breasted.

The \$1,000-Prize of the American Association for the Advancement of Science was awarded to Drs. P. W. Zimmerman and A. E. Hitchcock, Boyce Thompson Institute for Plant Research, for their research on the growth-stimulating hormones of plants.