

SCIENCE NEWS

Science Service, Washington, D. C.

SCIENCE IN 1939

MATHEMATICS

A NEW generalization of the length of a curve made it possible in 1939 to determine the "length" of very general sets of points in a plane. Properties of several important subsets of well-known function spaces were studied.

Progress on the famous continuum problem, which concerns infinite numbers and whether there is any infinite number substantially smaller than the number of points on a line and substantially larger than the number of whole numbers, showed that there is no inconsistency in assuming that no such number exists, although it has not been proved that there is no such intermediate number.

The ergodic theorem was extended on the one hand to the study of homogeneous chaos; on the other hand, to the problems of diffusion gases, hydrodynamics and statistical mechanics.

The mathematical theory of the change in temperatures occurring in a non-homogeneous bar with discontinuous initial temperatures was studied.

Properties of very general spaces were investigated by means of related configurations called "gratings."

An application of elegant modern methods for elliptic functions and fields to the study of the more general Abelian fields was outstanding in abstract algebra.

CHEMISTRY AND PHYSICS

ATOMIC energy was released in 1939 by the splitting of uranium atoms under neutron bombardment. Originally discovered in Germany, uranium fission was quickly confirmed in America and elsewhere. Experiments indicated that for each uranium atom split there was released 175,000,000 electron volts of energy.

Thorium and protactinium were likewise found to split and release their atomic energy.

The fission of uranium was found to be accompanied by the emission of other neutrons in a delayed reaction which may be the link in a chain reaction that potentially would make possible the practical release of uranium's atomic energy.

Barium, krypton, antimony, tellurium, iodine, strontium, yttrium, lanthanum, xenon, caesium and rubidium are among the elements found to be created by the splitting of uranium with the release of large amounts of energy.

Experiments showed that the work of extracting an electron from tungsten (electronic work function) which usually is assumed to be a constant in classical theory actually varies with temperature amounting to an increase in energy of .00006 electron-volts for every increase of one degree Centigrade.

A new type of chemical reaction obeying the laws of chance and operating between compounds hitherto believed to be inert to one another, as cream and milk, was discovered.

The most sensitive current detecting device ever created was developed which can detect .000,000,000,000,000,-

001 amperes, or a current equal to a single electron passing down a wire every five minutes.

Density, temperature and other important facts about the atmosphere up to heights of 24.8 miles were determined by use of a flickering searchlight beam and photoelectric cell detectors.

The world's most powerful continuous magnetic field, with a strength of 100,000 gauss, was created.

An improved and simple way of producing thiodiglycol, starting material in the manufacture of mustard gas, was developed.

Hydrogen fluoride was discovered to be an excellent catalyst for many vital organic chemical reactions, improving the yield of many reactions and making possible some which have not previously been attained.

A new synthetic silk-like fiber made from polyvinyl acetal resin, and known as Vinyon, approached commercial production.

Optical glass having the highest index of refraction (light-bending ability) and the lowest dispersion ever attained was patented.

The speed of light, fundamental physical constant, was determined for the first time by a completely automatic method that makes the observations independent of the observer.

ASTRONOMY

THE McDonald Observatory 82-inch telescope, second largest in the world, was put into use in 1939 on Mount Locke, Texas.

Television apparatus was devised to detect activity in the sun's corona without waiting for total eclipse, promising aid to forecasts of disruptions in intercontinental radio communication.

An unusual number of comets, 6 new and 7 returns of periodic comets found in previous years, were discovered: Kosik-Peltier, periodic Pons-Winnecke, Vaisala, Jurlof-Achmarof-Hassel, which came to naked eye brilliance, periodic Kopff, periodic Schwassmann-Wachmann, periodic Brooks II, Rigollet, Kaminsky, periodic Tuttle, periodic Giacobini-Zinner, Friend, periodic Faye.

Five more supernovae, tremendous super-exploding stars, were discovered in distant nebulae; occurrence of three such recent outbursts in one nebula within 16 years suggested that in some galaxies a tenth of the stars may explode in a time equivalent to the period since the earth's rocks cooled.

Solar activity remained at a high level during the year, with sun-spots totaling more than 200 on many days, auroral displays of unusual intensity and interference with long distance radio communication.

Mars made the closest approach to the earth in 15 years, Jupiter came nearer the earth than in 24 years, Saturn came closer to earth than in 20 years.

Two more extremely dense "white dwarf" stars, one with a weight of 9,000 tons per cubic inch, were the first discoveries made with the new McDonald Observatory telescope.

Harvard Observatory's 10,000th variable star was discovered.

A gigantic aura of stars was discovered enveloping our own universe of stars, the Milky Way.

EARTH SCIENCES

A GOVERNMENT-SPONSORED American expedition to Antarctica set sail in 1939, equipped with planes and a specially built snow cruiser, to amass geologic, geographic and oceanographic data and collect zoological specimens and information.

A new method was developed for obtaining geologic data on the deep bottom of the ocean by means of TNT explosions.

A new type of "robot" unmanned observatory made possible the obtaining of weather data in remote and inaccessible places, like exposed mountain tops and the polar regions.

The U. S. Weather Bureau made two innovations: "breakfast time" radio broadcasts and combination aviation and general forecasts made at airfields.

A large iron meteorite was found in Modoc County, Calif.

There were more than 35 earthquakes of sufficient severity to be registered on the world-wide network of seismograph instruments.

After a nearly normal summer, an unprecedented autumn drought gripped most of the country.

The North Atlantic iceberg season was the longest on record.

The first submarine charts of the eastern coast showing depths out to some 10,000 feet with all sounding incorporated in submarine contours were issued.

A submarine peak, rising nearly two miles above the ocean bottom, was discovered in the Gulf of Alaska.

A new "deepest spot" for the Atlantic, 5.7 miles, was found in the Nares Deep, north of Puerto Rico.

BIOLOGICAL SCIENCES

ONE of the big biological events of the century was the discovery, off the eastern coast of South Africa, of a large, deep-sea fish belonging to a group supposedly extinct since the days of the dinosaurs. The scaly monster, about five feet long and having huge blue eyes, has been given the scientific name *Latimeria chalumnae*.

Two human embryos, only eleven days old, were studied.

Light, either artificial or from the sun, serves to increase the ability of plants to withstand midsummer heat, experiments showed.

Undifferentiated plant tissue was induced to grow indefinitely in test-tubes.

A new genus of palm found on Cocos Island was named *Rooseveltia frankliniana* in honor of the President.

Oxygen requirement of a fertilized mammalian egg was found to be 0.00073 cu mm per hour.

A new method was devised for measuring soil moisture, by passing electric current through a buried block of gypsum.

A chemical necessary for the capture of carbon dioxide in food formation by plants was found.

Seedless watermelons were produced by chemical treatment of unpollinated flowers.

A plant growth-retarding substance was discovered.

A substance that makes plant wounds heal was discovered and named traumatic acid.

Legs were successfully cross-transplanted among embryos of chickens, turkeys and other fowl.

Colchicine was extensively applied in the breeding of new varieties of plants.

A new type of rubber cavity-filling for tree wounds was designed to provide an inexpensive treatment.

A new cooperative system for artificially inseminating cows, ewes and other farm animals was inaugurated in several states.

ANTHROPOLOGY AND ARCHEOLOGY

At Tanis, entering the tomb of Pharaoh Shishak I, plunderer of Solomon's Temple in Jerusalem, archeologists found the place undisturbed and the Pharaoh enclosed in silver and gold coffins. First discovery of Neanderthal Man in Central Asia was reported in 1939, the skeleton of an eight-year-old boy, unearthed near Tashkent, Turkestan.

The oldest known dated monument in America, the equivalent of 291 B.C. by one correlation, 31 B.C. by another, was discovered in Tres Zapotes, Mexico.

Nestor's Palace of Odyssey fame was found on the Promontory of Pylos, and in the ruins lay hundreds of archives in Cretan-like script.

The impressive ship grave of an Anglo-Saxon king, probably Redwald, who died about 620 A.D., came to light in Suffolk.

Measurements of 147,000 American children provided the clothing industry with its first scientific basis for sizing children's clothes.

Hailed as a new and important link between man and ape, a distinctive fossil tooth found at Sterkfontein, South Africa, was believed allied to remains of the man-ape of 50,000 to 100,000 years antiquity previously found in the same district.

An extraordinarily well-preserved Neanderthal skull with well-developed brain capacity was unearthed on the west coast of Italy.

Seven skeletons of "modern mankind" which had been found in the cave of Peking Man, China, were scientifically described and pronounced surprisingly varied with the inclusion of Indian-like types.

A village unearthed in Arctic Alaska revealed a form of prehistoric Eskimo life quite different from anything previously seen.

Beads and additional types of tools were found at the only known camp of Folsom Man in Colorado, clarifying the picture of earliest Americans as equal in culture to Stone Age Europeans of the same era.

Tree-ring technique of dating pueblo ruins in America was reported applicable to certain Viking and pre-Viking sites in Scandinavia; also to New England sites.

Life of refugees when Crete's civilization fell about 1100 B.C. was shown by excavation of a city of refuge on Mount Kaphi, Crete.

Exploration of a royal chamber tomb of the Mycenaean

age in Athens showed that before the Trojan War era that city was rich and important.

PSYCHOLOGY AND PSYCHIATRY

THREAT of European conflict and its reality stimulated research on the mental causes leading to war, effects of propaganda and war on the minds of belligerent and neutral peoples and means of protection from its influence.

Dentists, artists, engineers and teachers, not clergymen, church members, lawyers or domestic servants, were found to be more numerous in the cities rating highest in "general goodness of life."

Use of strychnine to vary the pattern of brain waves from the sensory cortex made possible the mapping of that area which was found to be very large with major subdivisions serving sensation in the face, arms and legs separately.

Idea of a strictly localized speech center in the brain came into further question when it was observed that some patients recover after loss of speech through brain injury.

The drug curare was found to depress the brain cortex or that part of the higher nervous system between the cortex and the spine so that learning can take place only through sub-cortical parts of the nervous system, explaining ability of the drug to produce "dual personality."

A special fund of more than \$100,000 was set aside from the U. S. Government's civilian pilot training program to develop new and better methods for selecting and training pilots.

Brain wave study revealed that a chemical pacemaker controls the brain's activity through cell respiration, promising new understanding of brain syphilis.

Blood tests revealed that cell respiration in the brain is heightened during the fever treatment for the mental disorder paresis, brain syphilis, throwing new light on how the treatment benefits.

ENGINEERING AND TECHNOLOGY

A PRACTICAL way of extracting the important metal manganese from low-grade ores was developed in 1939; also the use of small amounts of lead in steel to improve greatly its fabrication properties.

The U. S. Navy opened its new \$4,500,000 towing tank at Carderock, Md.

Gas turbines which in wartime emergency can be buried underground with only fuel and air inlet and an electric cable outlet were developed in Europe and already several are in operation in the United States in industrial plants.

Commercial production was begun of high test gasoline, using sulfuric acid as the chemical catalyst.

The *S.S. America*, 30,000-ton passenger liner and largest ever built in America, was launched.

Commercial development was undertaken of frequency modulated radio transmission which makes possible transmission without interference from natural or man-made static.

The fulchrograph, a rotating magnetic lightning recording device, was developed, which successfully measured the maximum current of a direct lightning stroke and charted its complete wave shape.

By a new process of insulating telephone wires the number of wires which can be placed in present size cables was increased by 606 to a total of 4,242 wires.

Accurate values for the viscosity of steam up to pressures of 2,000 pounds and temperatures of 1,100 degrees Fahrenheit were established.

Scheduled television programs, after many years of laboratory experimentation, were inaugurated.

Shasta Dam, irrigation project in the Sacramento-San Joaquin Valley, Calif., was begun.

The Federal Government began the acquisition of strategic mineral stockpiles with a \$10,000,000 purchase fund.

Iron 99.99 per cent. pure was made to serve as a spectroscopic standard.

MEDICAL SCIENCES

THE pneumonia case fatality rate was materially cut in 1939 by use of the new chemical remedy, sulfapyridine, while this and the related chemical, sulfanilamide, were reported promising in treatment of smallpox, primary peritonitis in infants, certain tropical diseases, infection with hemophilus influenzae (not virus influenza), tularemia, trichinosis, otitis media, gonorrhea, meningoencephalitis of dogs, chronic ulcerative colitis; not useful in tuberculosis; and an effective vital stain for plant and animal tissues.

The National Cancer Institute at Bethesda, Md., was completed and occupied by its cancer research staff.

New buildings for Memorial Hospital for the Treatment of Cancer and Allied Diseases, in New York City, were completed.

A bill to extend medical and health services throughout the nation through a national health program was introduced into the Senate by Senator Robert F. Wagner, N. Y., and hearings were held and a preliminary report made, but the bill was not reported out of committee before Congress adjourned.

Refrigeration of human cancer patients to the point of artificial hibernation gave relief of intractable pain in more than 80 hopeless cases with regression of the tumor in some.

Cases of ulcerating x-ray and radium burns were cured with no recurrence during 10 years and probably prevented from becoming cancerous by treatment with alpha rays, beryllium and boron.

Treatment of cancer by neutron rays from the cyclotron was started.

"Cocktails" of radioactive sodium phosphate proved at least as effective leukemia treatment as x-rays in preliminary human trials of what is hoped will prove a "cure" for this fatal disease.

Vitamin K has been obtained in crystalline form and its chemical constitution has been determined as probably 2-methyl-3-phytyl-1, 4-naphthoquinone. Similar naphthoquinone compounds made synthetically exert the same influence in promoting the formation of prothrombin, one of the necessary factors in blood coagulation. They have been used successfully in treating certain diseases in which bleeding occurs from lack of prothrombin, such as obstructive jaundice and the bleeding of new-born infants.