SCIENCE NEWS

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SCIENCE IN 1940

MATHEMATICS

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

It was shown that a square can be cut up into a finite number of smaller squares no two of which are of the same size.

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

An automatic machine to play the mathematical game of Nim was constructed and exhibited.

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

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

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

New and definitive contributions to lattice theory appeared, emphasizing the very wide applications of lattices to the combinations of given algebraic systems.

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

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

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

CHEMISTRY AND PHYSICS

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

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

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

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

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

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

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

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

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

Radio waves transmitted by atoms were discovered and measured, with them such subtle properties of atoms and molecules as the magnetism of their component parts can be measured a hundred times more accurately than by any previous method.

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

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

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

A new synthetic rubber was announced, and tires, made from another kind of synthetic rubber, were placed on the market.

A heavy isotope of sulfur, making up about four per cent. of ordinary sulfur, was isolated.

Elements heavier than uranium, formerly supposed to have the heaviest possible atoms, were obtained in the laboratory.

ASTRONOMY

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

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

The probable relationship between Encke's comet and meteors of the autumn Taurid shower was demonstrated.

Taking into consideration new measures of their dis-

tances, the diameters of the largest known stars were recalculated, giving first place to Ras Algethi, in Hercules, with 690,000 miles, and demoting Antares, formerly supposed to be largest, to fourth place.

Four exploding stars, of the type known as "supernovae," were found in distant star systems.

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

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

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

The world's highest astronomical observatory was established at Fremont Pass, Colo., an altitude of 11,318 feet, as a branch of the Harvard College Observatory for study of the sun's corona.

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

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

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

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

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

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

Earth Sciences

A SEVERE earthquake caused widespread death and destruction in Rumania on November 10; during the year there were 36 other quakes sufficiently severe to register themselves on distant seismographs.

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

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

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

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

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

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

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

Biological Sciences

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

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

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

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

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

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

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

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

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

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

White pines resistant to blister rust were discovered in Wisconsin.

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

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

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

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

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

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

Anthropology and Archeology

NAVAJO INDIANS saw their language put into alphabetic writing for the first time. New equipment made it possible to play safely thousands of frail cylinder records on which scientists have preserved folk music and primitive songs.

An archeologist of today buried the Time Capsule at the New York World's Fair, packed with exhibits and records of our civilization for the archeologists of 6939 A.D.

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

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

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

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

The Coronado Cuarto-Centennial celebrated in the Southwest stimulated historic and archeological study of their route.

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

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

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

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

Psychiatry and Psychology

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Engineering and Technology

It was found possible to predict three months in advance the best frequencies to use for dependable radio transmission. Recorded music of orchestra, organ and choir was reproduced with its original tonal range and spatial sense, and a tenfold greater range of loudness.

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

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

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

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

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

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

(To be concluded)