SCIENCE NEWS

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SOME ADVANCES IN THE PHYSICAL SCIENCES DURING 1930

A NEW physical concept, the paradoxical one that two separate particles of matter can be completely identical, was enunciated by Professor Gilbert N. Lewis, of the University of California.

That space is not empty but filled with electrons of minus or negative energy, was suggested by Dr. P. A. M. Dirac, of the University of Cambridge, England.

A new theory of the universe, assuming that it is non-static and consisting of matter dissipating through radiation, was propounded by Dr. Richard C. Tolman, of the California Institute of Technology.

The possibility that the whole universe is fading away so that in some timeless future no matter will remain, only radiation, was indicated by calculations made by Dr. Louis S. Kassel, of California Institute of Technology.

The theory that cosmic rays are not rays at all but high velocity particles was advanced by two German physicists, Dr. Walter Bothe, of Berlin, and Dr. Werner Kolhoerster, of Potsdam, as a result of experiments they have conducted with a specially built adaptation of the electron counter, but researches of Dr. R. A. Millikan on the intensity of cosmic rays near the north magnetic pole provide evidence against the theory.

The theory that cosmic rays consist of high-velocity particles, like tiny bullets, was supported by experiments conducted by Dr. L. F. Curtiss, of the U. S. Bureau of Standards, in which he used two electron counters.

A clock which will set itself in response to radio-time signals was developed by H. C. Roters and H. L. Paulding, of the Stevens Institute of Technology.

A new type of clock controlled electrically by a vibrating crystal, thus dispensing with a pendulum, has been developed under the direction of Dr. W. A. Marrison, of the Bell Telephone Laboratories.

A moulded compound, including silicon carbide or carborundum, which has the quality of preventing the flow of electricity at low voltages while allowing it to pass at high potentials, was developed at the laboratories of the General Electric Company.

The method by which the diameters of stars have been measured through the interference of light waves was applied to the extremely accurate measurement of terrestrial distances in an instrument developed by Stuart H. Chamberlain, of Michigan State College.

A device for measuring the intensity of ultra-violet rays by means of an ultra-violet-sensitive photoelectric cell connected with a condenser, which as it discharges operates a counter, was developed in the research laboratories of the Westinghouse Lamp Co.

A film phonograph capable of playing for two hours from a 400-foot reel of motion picture sound film was perfected by Dr. C. H. Hewlett, engineer of the General Electric Company.

A method for stopping a locomotive with the reflected light from its own headlights caught on mirrors on the signal post and focussed by them on a series of light-sensitive cells was demonstrated in Germany.

Alternating electric current is more dangerous at low voltages than at high, it was discovered through experiments on rats at the Johns Hopkins University: with the ordinary house potential of 110 volts, 100 milliamperes will cause death.

Electric current direct from sunlight was made possible through the invention by Dr. B. Lange, of the Kaiser Wilhelm Institute for Silicate Investigation, of a new type of cell containing copper oxide between two layers of metallic copper.

Dr. Ernest O. Lawrence, of the University of California, with his associate, Dr. N. E. Edlefsen, devised a method for increasing the speed and energy of the protons or hearts of hydrogen atoms, so that it may be possible when the method is further perfected to use them as atomic projectiles for smashing the hearts of other atoms, transmuting them into other substances or releasing enormous quantities of atomic energy.

A method of taking photomicrographs by long-wave ultra-violet light through an ordinary glass lens, was discovered by Dr. A. P. H. Trivelli, of the Eastman Kodak Company, and Leon V. Foster, of the Bausch and Lomb Optical Company.

The final value for the most accurate measurement ever made of the constant of gravitation was announced after seven years' work by Dr. Paul Heyl, physicist of the U. S. Bureau of Standards, to be the fraction 6.670 over 100,000,000.

Artificial gamma rays, which may take the place of radium in the treatment of cancer, are produced by a giant vacuum tube operating at 700,000 volts, at the California Institute of Technology.

An electric photoflash lamp, a German invention, for taking flashlight photographs without noise or smoke was introduced in the United States, the light being made by aluminum foil ignited electrically in a bulb full of oxygen.

Chemistry

The existence of rotating molecules in solid compounds was reported by Professor Linus Pauling, of the California Institute of Technology, and Dr. Sterling B. Hendricks, of the Fixed Nitrogen Laboratory, U. S. Department of Agriculture. This discovery has an important bearing on the heat capacities of solids.

The magnetic susceptibility of samarium sulphate octohydrate was announced by Dr. Simon Freed, of the University of California, arousing great interest among chemists because the discovery indicates the possibility of electronic isomers in the solid state.

The chemical puzzle of the structure of the crystal of the silicates was solved by Professor William L. Bragg, Victoria University of Manchester, England, and Profes-

sor Linus Pauling, of the California Institute of Technology.

A new gas for use in electric refrigerators, non-poisonous and non-inflammable, which is a compound of carbon, chlorine and fluorine, was the invention of Mr. Thomas Midgley, Jr.

That carotin, which makes some foods yellow, is important for nutrition as well as the green chlorophyl, because vitamin A is associated with this color in vegetables, butter, and egg yolk, was discovered by S. M. Hauge and J. F. Trost, of the Purdue University Agricultural Experiment Station.

Bacteria obtained from brewer's malt may now be pressed into the service of the chemist to eat away the cell walls of plant tissue and liberate the vegetable oil, according to a method developed by John Woods Beckman, industrial chemist, of Oakland, California.

A device for removing carbon monoxide from the exhaust gases of an automobile by means of a catalyst was demonstrated by the inventor, Dr. J. C. W. Frazer, of the Johns Hopkins University.

The richest source of helium yet discovered, a natural gas in southeastern Colorado containing seven per cent. of helium, was reported by F. F. Hintze, of the University of Utah.

Crystals of rubber were obtained for the first time in the chemical laboratories of the U. S. Bureau of Standards.

The U. S. Pharmacopoeial Convention, which meets once in ten years to decide on the contents of the Pharmacopoeia or standard for drugs and chemicals, met in Washington in May.

Astronomy

A new planet, the first to be discovered since 1845, was found photographically with a 13-inch telescope at Lowell Observatory in approximately the place predicted by the late Professor Percival Lowell, founder of the observatory, who died in 1916. The planet, which is farther from the sun than any other yet discovered, was later named Pluto.

That inter-stellar space, especially in the plane of the Milky Way, is not transparent, but filled with diffuse material that absorbs a considerable amount of light from distant stars, thus making the previous estimates of their distances too large, was indicated by researches of Dr. R. J. Trumpler, of the Lick Observatory, supported by independent work of Dr. Piet van de Kamp, of the Leander McCormick Observatory.

A faint group nebulae was found to be apparently speeding away from the earth at the rate of 7,200 miles a second, the highest astronomical speed yet recorded, by studies of Dr. Edwin P. Hubble and Milton L. Humason, of Mt. Wilson Observatory, but it is supposed that the effect is really an illusion, due to curvature of space.

The eccentric little planet Eros, which aids astronomers in determining the earth's gravitational power and the sun's distance, approached closer to the earth than it has at any time since its discovery in 1896.

That many stars are spinning at the rate of 40 miles a second, 150 times the speed of the earth at the equator, was discovered by a new method developed by Dr. Otto Struve, of the Yerkes Observatory, in collaboration with a Russian astronomer, Dr. G. Shajn.

An unusually large display of Leonid meteors was visible on the early morning of November 17, suggesting the possibility of a brilliant shower in November, 1932, 1933 or 1934.

Long-range forecasting of weather may be made possible through the discovery by Dr. C. G. Abbot, secretary of the Smithsonian Institution, that there is a close correspondence between changes in the sun's radiation and in temperature at Washington, D. C.

The theory that stars have a structure similar to that of an egg, a dense yolk in the center, surrounded by a lighter material, was advanced by Professor E. A. Milne, of the University of Oxford.

A new theory of the construction of the universe, that it constitutes a huge system made by the condensation of a loose swarm of smaller clusters of stars which were originally like the mysterious spiral nebulae, was proposed by Dr. Harlow Shapley, director of the Harvard College Observatory.

That Halley's comet had two distinct tails was concluded by Dr. N. T. Bobrovnikoff, of the University of California, after three years of intensive study of 700 photographs taken of the comet in 1910.

The surface of the moon is apparently covered with volcanic ash, according to researches conducted by Dr. B. Lyot, of the Paris Observatory.

The theory that the earth may have a comet-like tail sometimes visible as a faint patch of light called by astronomers the "Gegenschein," was advanced by Dr. E. O. Hulburt, of the U. S. Naval Research Laboratory.

On April 28, the United States saw its first total eclipse of the sun since 1925 when the shadow of the moon just touched the earth on a path which passed through California, Nevada, Idaho and Montana.

A total eclipse of the sun, on October 21, was witnessed by two parties of astronomers from tiny Niuafou Island in the Pacific.

The length of Neptune's day was found by Dr. J. H. Moore, of the Lick Observatory, to be about 16 hours.

A new 50-foot interferometer, a giant instrument for the measurement of the diameter of stars through the interference of reflected light waves, was completed at Mount Wilson Observatory in California.

That arsenic and germanium are both present in some meteorites that fall to the earth was discovered by Dr. Jacob Papish and Zaida M. Hanford, Cornell University chemists.

On November 15, 1930, astronomers commemorated the three-hundredth anniversary of the death of Johann Kepler, the great German astronomer who first enunciated the laws of planetary motion.

America's first planetarium in which the observer may at will see a facsimile of the heavens as they look at any time and from any place, was opened on May 10 at Chicago.

A daily broadcast of cosmic data, including number of

sun-spots, solar radiation constant and data on magnetic disturbances, was inaugurated by *Science Service* with the cooperation of the International Scientific Radio Union.

The discovery of seven comets was announced during the year, though one was not confirmed and another was a return of a periodic visitor. The first and fourth were discovered by Drs. Schwassman and Wachmann, of the Hamburg Observatory, Germany, though the former was independently found by L. C. Peltier, an amateur astronomer of Delphos, Ohio. The second was discovered by Beyer, also at Hamburg; the third by Wilk, of Cracow, Poland; the fifth by D. L. Forbes, of Rondebosch, South Africa; the sixth was the re-discovery of Temple's second comet by Dr. George Van Biesbroeck, of the Yerkes Observatory, and the seventh was by Nakamura, of the Kyoto Imperial University, in Japan. Efforts of American astronomers to find Nakamura's comet, which Japanese dispatches said had been observed by Sibata, of the same observatory, were unsuccessful, however.

Engineering

After a third attempt, Professor Georges Claude was successful in obtaining power from the temperature difference in the ocean water at the surface and in the depths of the tropical seas off the Cuban coast.

The two longest steel arches in the world were closed —the Kill Van Kull Bridge at New York with a 1,675-ft. span and the Sidney Harbor Bridge, Australia, 1,650-ft.

An elevated monorailway 30 miles long carrying a propeller-driven car which travels 120 miles per hour was completed near Glasgow, Scotland.

Application of the hydrogen-ion of crude oil, which greatly increases the production of gasoline, was extended.

The city gas business was further invaded by natural gas and its by-products, propane and butane, and petroleum refinery gas; natural gas being piped as far as 1,000 miles to centers of population.

Construction progressed on the world's largest hydro-electric power plant, the Dneprostroy project in Russia, which will have an ultimate capacity of 750,000 hp., and on the largest hydro-generators, 77,500 kilovolt-ampere capacity, and turbines, 84,000 hp. capacity.

Final work was done on the new Welland Canal, a mammoth structure built by Canada to pass sea-going lake grain vessels up and down the 326.5-foot difference in elevation between Lake Erie and Lake Ontario.

Plans were made and bonds authorized for the $35,000,000 Golden Gate Bridge at San Francisco, the center suspension span of which will be 4,200 feet, the longest in the world.

U. S. Department of Interior began preliminary field work on the construction of the 730-foot Hoover Dam, world's highest, a part of the Boulder Canyon project on the Colorado River.

The Detroit-Windsor vehicular tunnel, connecting Canada and the United States beneath the Detroit River, was opened to traffic.

An experimental boiler designed to operate at pressures ranging from 3,500 to 4,500 pounds per square inch and a temperature of 833 degrees Fahrenheit was built.

A severely stream-lined railway car driven by a 400 hp. airplane engine and propeller sped more than 100 miles per hour on a straight track in Germany.

Construction progressed on the Ft. Lee 3,500-ft. span suspension bridge across the Hudson River at New York and the 1,500-ft. Mid-Hudson suspension span at Poughkeepsie.

The application of welding to steel building was greatly extended, the number of such buildings being increased 50 per cent.

The world's longest concrete arch bridge was built at Brest, France, with three spans, each of 612 feet.

The *Europa*, new German ocean liner, entered service and became speed queen of the North Atlantic by bettering the record of her sister ship, the *Bremen*.

The U. S. Bureau of Standards prepared for the construction of a National Hydraulic Laboratory provided for by Congress at a cost of $350,000.

Coolidge Dam across the Gila River canyon near Globe, Ariz., a dam of unusual construction making use of multiple domes, was dedicated by the ex-president for whom it was named.

The fiftieth anniversary celebration of the American Society of Mechanical Engineers was held.

The first roller-bearing locomotive was built and put in service.

The Keenan Steam Tables and Mollier Diagram, which for the first time tabulate and graphically present the properties of steam at the higher temperatures and pressures at which it is now being used in large power plants, was published by the American Society of Mechanical Engineers.

Chicago's Merchandise Mart, said to be the largest building in the world, was completed.

The U. S. Patent Office issued 49,599 patents and accepted 117,790 applications during the fiscal year ending in June.

Construction advanced on the world's largest high-pressure turbine-generator, a 110,000 kilowatt steeple compound unit to operate at 1,200 pounds per square inch pressure in the River Rouge power plant near Detroit.

The highest boiler pressure ever used in America, 1,800 pounds per square inch, was employed in a 6,000 kilowatt power plant nearing completion at Lockland, Ohio.

The highest bridge in the world, carrying a highway 1,260 feet above the Arkansas River, was completed over the Royal Gorge near Canon City, Colorado.

A radio telephone service was installed between New York and Buenos Aires, making possible the connection by radio phone of four continents—North America, South America, Europe and Africa.

The first completely welded ocean-going cargo vessel was launched at Charleston, S. C.

The world's first floating power plant, the *S. S. Jacona*, with a generating capacity of 20,000 kilowatts, was placed in service along the New England coast as a source of emergency power.