SCIENCE NEWS

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RELATIVITY

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THE new theory of relativity, which Professor Leigh Page, of Yale University, suggests, broadens the famous Einstein theory and makes it applicable to the happenings within atoms. In his report to *The Physical Review*, he shows that for atomic events on a microscopic scale either one or the other of the two basic "planks" on which the Einstein "special" theory of 1905 rests must be untenable. Both can not be right and coexist. The new theory does not controvert Einstein in the scale of cosmic occurrences.

Professor Page explains his work as follows:

"The 'New Relativity,' broadens rather than controverts Einstein's theory. It was suggested by the point of view presented by E. A. Milne, of Oxford, in his recent book 'Relativity, Gravitation and World-Structure,' in which the author dispenses with the undefinable concepts of rigid measuring rods and periodic clocks and bases his theory on the concept of light-signals traveling with constant velocity. In its present state of development the new theory is an extension of the special theory promulgated by Einstein in 1905, rather than a modification of his general theory of 1915. Hence its applications are to microscopic rather than to cosmic phenomena.

"The inertial systems of Einstein's special theory constitute a group of reference frames each of which has a Euclidean geometry and a constant light-velocity. These reference frames have constant velocities relative to one another. The significant discovery reported in the 'New Relativity' is the existence of other reference frames characterized by Euclidean geometries and constant light-velocities, which are accelerated relative to one another. If, then, there are no preferred reference systems in an effectively empty region, the laws of nature must be the same relative to the newly discovered reference frames as they are relative to the inertial systems considered in Einstein's theory. In this way the theory leads to the possibility of types of motion not allowed by the older theories, and offers the hope of acquiring a better understanding of the motions occurring in the atom."

THE EFFECT OF HEAVY WATER ON THE HUMAN BODY

A NEW and more precise value than has ever been obtained for the viscosity, or flowing qualities, of "heavy" water has been calculated in a research conducted at Harvard University by Professor Grinnell Jones and Dr. H. J. Fornwalt. Better knowledge of what effect heavy water may have on the body is only one possibility of the research.

Using an automatic timing device instead of the hand-operated stop watch employed for timing in previous viscosity tests, it was found that deuterium oxide, as heavy water is technically known, has a viscosity 23 per cent. greater than that of ordinary distilled water.

Although this figure differs only slightly from the results of other experimenters, who found a value of 23.2 per cent., the new figure is considered of importance in view of the extreme precision necessary in the calculations of modern science. This precise viscosity measurement, for example, may prove to be of considerable importance to physiologists studying the effect of heavy water, which constitutes two hundredths of one per cent. of ordinary water, as found in the human body.

Investigations which have been in progress since the discovery of heavy water in 1934, may also benefit from the more accurate measurements. Outstanding among these are investigations to determine how the fluid affects animals and plants and research seeking to determine the electrical conductivity of the new liquid. It is also expected to aid in checking the possibility that the double-weight hydrogen atom alters important calculations and assumptions made before the discovery of heavy water.

These viscosity tests are similar to others in that the speed of fall of the liquid in a glass capillary tube forms the basis measurement. In early experiments on heavy water, however, observation of the speed of fall was made by the human eye, and the time recorded with a hand-operated stop watch. This method, of course, involves the possibility of inaccuracy on the part of the observer and does not give a satisfactory timing record, since even the best stop watches are accurate to only a tenth of a second.

An automatic timing device, which replaces the human eye with the infallible photoelectric cell, was used in the experiments. Time records were made on a fast-moving chronograph tape which enabled measurements accurate to one hundredth of a second. It is estimated that the possible error can not exceed three or four thousandths of one per cent.

The research was undertaken at the suggestion of Dr. Harold C. Urey, who discovered heavy hydrogen after he had seen Professor Jones' equipment for precise viscosity measurement. Professor Jones is now conducting experiments to determine the surface tension of heavy water, also at Dr. Urey's suggestion. The fluid for both experiments was supplied by Dr. Urey.

THE HARDENING OF SANDY SOIL

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TURNING porous sandy soil into solid rock-like material with the texture of medium hard sandstone is the latest technique by which European chemists are now strengthening subway tunnels, improving hazardous foundations of buildings, plugging leaks in the beds of streams of valuable mineral springs and restoring underwater dams.

The system, known as the Joosten process of soil solidification, consists of injecting into the soil two chemical solutions which combine to form a gel-like material. The gel material has a high surface tension and acts to draw the sand particles closely together. Loads of 1,100

pounds to the square inch are successfully withstood by the artificially solidified sandy soil.

Applications of the new method are many. The Cathedral Church of Ribe in Jutland rested on closely packed chunks of rock lying on a bed of fine sand. In the course of years and due in part to increasing near-by motor truck traffic, the foundations subsided and cracks appeared in the masonry.

Underpinning the walls with girders was deemed inadequate. It was decided to widen the foundation by means of chemical solidification in the underlying sand layer. The operation was so successful that the menace to the cathedral structure no longer exists.

In connection with recent construction on London's subway system the method was also tried successfully. Injection pipes for the chemicals were driven through the planking used to line the finished part of the tunnel. A chemically solidified arch of smooth gravel was formed in the tunnel's roof. When the time came to cut away parts of the roof which projected into the tunnel profile, pneumatic chisels had to be used because of the strength of the material.

Moreover, the process has been used to plug leaks in a stream of valuable medicinal waters at Teplice-Sanov in Czecho-Slovakia near the Austrian border. The stream bed consisted of sand and silt lying on top of a sandstone layer. Cracks developed in the sandstone and the valuable waters were leaking away.

By putting down injection pipes the chemicals were turned into the sand and silt and brought about successful solidification.

The two solidifying chemicals are reported to be silicic acid, which is put into the sandy soil first, and an unnamed salt solution that immediately reacts with the silicic acid to form an insoluble colloidal silicic acid gel. For successful operation a careful study must be made of the soil type and use confined to sandy layers. The technique will not work for clay or mud.

MODEL OF THE GREAT TELESCOPE

A SMALL telescope, just a tenth the size of the great 200-inch telescope now being built for Mount Palomar, Calif., is being constructed as a miniature "first edition" of the giant instrument with which astronomers a few years hence will extend the limits of the known universe.

This became known when the Observatory Council of California Institute of Technology announced that the giant mounting that will hold and direct at the sky the world's record 200-inch sky mirror will be built in Philadelphia by the Westinghouse Electric and Manufacturing Company. The tenth scale working model will permit rigorous tests to be made in advance of actual construction.

The designs of the mounting are being made by the California Institute, which is also building the working model. The model tests will insure the necessary extreme rigidity of the large instrument, the best type of bearings, guarantee ease and steadiness of rotation of the polar axis, and the perfection of all parts.

After these tests have been made, the engineers of the Westinghouse company will assist the engineers and draftsmen of the Institute of Technology in the completion of working drawings, for use in their shop.

The scale of the telescope is shown by the fact that the tube, carrying the 200-inch mirror at its lower end, will be about 20 feet in diameter and 55 feet long. The whole instrument must be constructed with great care, not only to serve as a suitable support for the 200-inch concave mirror but also to keep it accurately directed to the stars in their apparent motion from east to west, which is due to the rotation of the earth.

The 200-inch glass disk for the mirror, soon to be shipped from Corning, New York, will be ground, polished and figured in the optical shop of the California Institute. Much of the accessary apparatus to be used with the telescope will also be built in the instrument shop, adjoining the optical shop on the campus.

COLD VACCINE

KEEP a bottle of common cold vaccine in your bedroom. Once a week throughout the winter swallow a dose at night on an empty stomach. This advice for protecting yourself against colds and influenza is given by Drs. David Thomson, Robert Thomson and E. T. Thompson, of St. Paul's Hospital, London. It is based on their researches on oral vaccine for colds and influenza which they report to *The British Medical Journal.*

It is reported that doses of the cold vaccine taken this way since September gave protection against colds and influenza in spite of considerable exposure to these diseases. The vaccine does not produce toxic effects provided it is not taken more than once a week.

The vaccine used is made up of Pfeiffer's bacillus, pneumococci, streptococci and another nose and throat "germ" known as *M. catarrhalis.* Serious colds and influenzas are, in the opinion of the English physicians, usually due secondarily and sometimes primarily to those organisms or "germs."

In their report, the English physicians refer to similar work on the same type of cold vaccine to be taken by mouth which was reported by three American investigators, Drs. George E. Rockwell and Hermann C. Van Kirk, of the University of Cincinnati, and Dr. H. M. Powell, of the Lilly Research Laboratories, Indianapolis. They reported a 70 per cent. decrease in the number of colds contracted by over 400 persons who took the cold vaccine capsule before breakfast once or twice a week through the common cold season.

BOTANICAL PAPERS PRESENTED AT THE ST. LOUIS MEETING OF THE AMERICAN ASSOCIATION

X-RAYS stimulate growth of soybeans, at least a little, if the seeds are treated before planting with short exposures to rays that are not too penetrating or "hard," Theo. P. Long and Professor H. Kerston, of the University of Cincinnati, reported. One variety of soybean, after x-raying of seeds, showed an increase of 2.3 per cent. in total weight of above-ground parts of the plants, as compared with untreated seeds. Another variety showed an increase of 5.9 per cent. Some individual

plots of plants showed as much as 10 per cent. increase after treatement. In general the stimulation "would seem to be real though small," Mr. Long commented.

CHRISTMAS trees in millions of American homes now shed needles all over the carpet, driving harassed housewives to "never-again" vows—which they will certainly break next year, because the children must always have their tree. Christmas trees need not become such a nuisance, Dr. R. H. Carr, of Purdue University, reported. There are chemical means for preventing it. Dr. Carr has kept Christmas trees alive and in full glory of glossy needles and piney odor for as long as two months, by setting the cut ends of their trunks in solutions of certain organic calcium salts. Some other plant parts, like lilac flowers, have been kept in place for a whole year, but the flowers lost their color.

TWO months of growth were compacted into ten minutes of natural-color motion pictures, in films shown recently before the meeting of the American Society of Plant Physiologists, by Professor J. C. Ireland, of Oklahoma Agricultural and Mechanical College. The films were taken by the "time-lapse" method, in which an exposure is made once in several minutes, or even in several hours, instead of the usual rate of sixteen a second. When such "time-lapse" films are projected at ordinary speed, the events portrayed are immensely speeded up. In Professor Ireland's films, the scientists could see the effects of four different treatments of growing cotton plants. One was given nothing but distilled water, a second received fertilizer consisting of ammonium nitrate, a third got potassium sulphate and the fourth calcium phosphate. At first, during the early seedling stage, the potash-fed plant sprinted ahead, but later on its phosphate-treated twin staged a remarkable rally. The changes in color of the plants were as striking as the records of their rates of growth.

BORON, an element most familiar in the common household chemicals borax and boracic acid, is indispensable for the normal growth of plants. They need only a minute trace of it, but if deprived of that minimum quantity they become very sick. Consequences to corn plants of boron starvation were described by Dr. E. T. Eltinge, of Mount Holyoke College. The plants soon lost their normal green color, their young leaves failed to unroll, their root tips became swollen and stunted, and by the end of three weeks growth had practically ceased.

WE may all soon be eating turnips as a means of getting goiter-preventing iodine into our systems, just as we now eat spinach for the vitamins it contains. Or if we live in the South, we may combine the two benefits in a dish of turnip greens. Dr. Warren B. Mack told of experiments with many kinds of vegetables, to see which would make best use of iodine applied with fertilizer to the soil. He found turnips to be most efficient, increasing their iodine content more than a hundred-fold when plenty of that necessary element was available in the soil.

SPORES of the fungi that cause plant diseases bring about their own destruction when they come into contact with Bordeaux mixture. How this "suicide" is accomplished was told by Drs. S. E. A. McCallan and Frank Wilcoxon, of the Boyce Thompson Institute for Plant Research. Bordeaux mixture contains copper, and copper is deadly to fungus growth. The spores secrete some substance that makes the copper soluble, and in that state it is active against the spores. Analysis by delicate microchemical methods indicated that the copper-dissolving substance in the spore secretions is malic acid, a compound found typically in apples but present in many forms of plant life.

ITEMS

A NEW theory explaining the long-baffling problem of the apparent dual nature of light which sometimes acts like a particle and at others like a wave motion has been reported to *Nature* by Sir Joseph Thomson. A photon of light, according to Sir Joseph, might well be regarded as a ring of electric force traveling at right angles to its plane. It would be like a ring slipping along a cane; the cane serving as the light ray. This picture of light is extended to consider a photon of light as a series, or train, of such rings. A quantum of light, it is suggested, would be a train of definite length of these electric rings of force that would be given out by an electron in falling between energy levels in an atom. A train of rings would make possible an explanation of the interference of light.

HEAVY WATER, with double-weight instead of ordinary single-weight hydrogen atoms, speeds the growth of ordinary green plants but slows the growth of non-green plants such as fungi. This discovery is announced by Professor A. J. Ewart, of Melbourne University. In his experiments, bacteria and fungi were retarded in growth. Yeast was either not affected at all or was slightly accelerated, although it also is a non-green plant. Oat seedlings and other green plants grew faster. Heavy water did retard green plants at one life stage: it slowed down the germination of seeds. But once they were sprouted their growth was more rapid.

DROUGHT-THREATENED, as well as cold-stricken, areas are in need of a forage plant that can withstand wide ranges of temperatures. After a long search a weed has been found that not only satisfies this condition, but can serve also as good feed under ordinary conditions. It is known as sickle lucerne, and it grows in a large number of types on the steppes of the Ukraine. This weed is remarkable in its endurance, can stand the longest, most devastating droughts, as well as the coldest snowless winters. It grows in sandy, clay, rocky, limy and salty soils. It has a strongly developed fibrous root system running in all directions and making use of the slightest moisture in the soil. In this respect it is said to be far superior to alfalfa. The food value of the sickle lucerne makes it a desirable feed plant. It contains 14.70 per cent. of nitrogen and 3.92 per cent. of fat.