SCIENCE NEWS

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ETHER DRIFT EXPERIMENTS AND THE EINSTEIN THEORY

NEW light on the question of the relation of matter to the ether of space comes from the experiments by Professors A. A. Michelson and H. G. Gale, of the University of Chicago, reported to the National Academy of Sciences at its recent meeting.

The plan of it was based upon an ingenious idea suggested by Michelson in 1904 and recently urged by Dr. Ludwik Silberstein, of Rochester, as a test of the relativity theory. Suppose we had a big steel pipe running around the world on an east and west line and mirrors so arranged in it that they would reflect a ray of light all the way around. Let us then send one ray east and the other west and match them up when they come back from their circuit of the earth to see if one took longer than the other. Now if the earth does not revolve, of course the ray going east will get back in just the same time as the ray going west. But if the earth is moving from west to east, the ray running east will take longer to return to the starting point than the ray running west because that point has moved eastward in the meantime.

They enclosed a certain area of the earth's surface at Clearing, Ill., near Chicago, by a rectangle of air-tight water-pipe a foot in diameter. The pipes were laid level underground and the air was exhausted by means of a pump to about a fiftieth of an atmosphere so as to avoid interference with vision due to air currents. The light from a slit in front of an arc lamp at one corner was directed against a glass plate coated with a thin film of gold and set at an angle so that half the ray of light passed through it and so straight ahead along the pipe, while the other half was reflected at right angles and so sent around the rectangle in the opposite direction. At each of the other three corners a mirror was placed in the pipes so as to reflect the rays along the next side of the rectangle.

The two rays having traveled more than a mile by opposite routes were matched to see whether their waves coincided or whether one had fallen behind the other owing to the earth's rotation. A shorter circuit was used to establish the zero point. The fringes, or alternate dark and bright lines, due to interference of waves were viewed through a seven-foot telescope and measured with a micrometer.

Two hundred determinations were made on various days and by different observers, and the average gives a displacement of the interferometer fringes, due to the earth's rotation, of about one quarter of a fringe. The exact figure found in the experiments is 0.23 while the figures calculated in accordance with Einstein's theory is 0.24. This is a remarkably close agreement, considering the difficulty of such an experiment, and proves that the ether is not appreciably dragged along with the earth in its rotation. If the observations had shown no displacement of the fringes the experiment would have been contrary to the special relativity theory of Einstein, but the results obtained may also be interpreted in harmony with the older theory of a stagnant ether so are not decisive between them.

Michelson's new experiments are incompatible with his experiments of 1881–87 from the standpoint of the old either theory, but they may be reconciled by adopting the Einstein point of view.

THE TEMPERATURE OF THE CORONA

NEW temperature determinations on the corona of the sun, based on observations made during the recent total eclipse, indicate that it is only about one half as hot as had been indicated by earlier work. The new calculations were made by Dr. W. W. Coblentz, of the U. S. Bureau of Standards.

According to Dr. Coblentz, the coronal temperature is about 3,000 degrees absolute, or approximately 5,000 degrees Fahrenheit. The earlier figures, computed in 1908, placed it at 6,000 degrees absolute, or 10,000 degrees Fahrenheit.

The corona, or pearly halo seen about the sun during the brief period of totality, is made up partly of either very finely divided solid particles or droplets of liquid elements. What these elements are there is no way of determining, for only glowing gases give light that may be analyzed with the spectroscope. At the temperatures that prevail in and near the sun, however, it is safe to conjecture that only the heavier elements would escape reduction to a gaseous state, and so be found as solid particles or liquid drops.

Bureau of Standards workers also investigated the red and green spectral lines of the hypothetical element "coronium," which appeared in the spectrographs of the recent eclipse. No element so far known on earth makes lines in the particular positions occupied by the "coronium" lines; but until other evidence can be found astrochemists are conservative about admitting its actual existence as an element. It is surmised by some to be an unknown form of a known element.

EARTHQUAKE PREDICTIONS

EARTHQUAKE predictions issued by an Italian scientist, Professor Bendandi, which have been published in America and which seem to have coincided with some recent earth shocks, have been severely criticised as unscientific and unfounded by Professor G. Agamemnone, declared to be the ablest Italian seismologist of the present time.

According to a published statement that has been received from Rome by scientists in Washington, Professor Agamemnone declared: "Bendandi evidently works on the laws of chance and predicts enough earthquakes to

have a fair average of success. He asks 24 hours leeway in his predictions, and with this and the number that actually occur he could scarcely fail to be right sometimes. His attempt appears to be a sensational effort to do something which many eminent scientists have worked on but in which they have as yet had little success.''

Professor Agamemnone says, however, that there is no kind of phenomena which lend themselves so readily to prediction as seismic phenomena. Over a period of thirty years there have been an average of thirty-eight earth tremors a month in Italy and therefore a prediction is nearly certain to be fulfilled. The Philippines have practically the same frequency, while Japan has 1,500 shocks a year or 4 a day.

It is understood that the Italian government decided that Bendandi's predictions for Italy were, regardless of their correctness, hurting the tourist trade and he was suppressed so far as Italy is concerned. Bendandi then transferred his activity and bestowed his predictions on other parts of the world.

SURVEY OF FRESH-WATER RESOURCES

THE little-used and little-known food resources of American rivers, lakes and ponds are the subject of a research program projected by the division of biology and agriculture of the National Research Council. Professor Maynard M. Metcalf, chairman of the division, is at present engaged in organizing a committee for the purpose of making a preliminary canvass of the situation and determining what program of action should be adopted.

''This is not merely a question of fisheries,'' said Dr. Metcalf. ''To obtain the information needed for a real knowledge of the food possibilities of our fresh waters we need to have the points of view of many types of scientists. We need the point of view of the aquatic botanist, for the foundation of all the life in the waters lies in the green plants, most of them of microscopic size, that capture chemical elements and sunlight and manufacture the basic foodstuffs. We need the point of view of the aquatic zoologist, for these microscopic plants are eaten by microscopic animals, which in their turn are victims of water insects and small crustacea. These in turn are food for smaller fish, and the little fish are eaten by the big ones; and here we need the fish expert. We need the chemist's point of view, for all life in the waters is very sensitive to chemical changes. And finally, we need the help of the pathologist and bacteriologist, for water life, like all other life, is subject to diseases.''

Dr. Metcalf said that his interest in the possibilities of exploitation of the waters, or ''aquiculture,'' was first roused during a sojourn in a Bavarian city, where a population of about 80,000 had been abundantly supplied with fish out of one small river for hundreds of years. He thinks it possible that a considerable part of the answer to the question of food needs for the increasing population of America can be met in the neglected waters of our rivers, lakes, marshes and small ponds. The small pond on the farm is an object of especial interest. Professor Metcalf stated that he would like to see every farmer in a position to raise his own fish.

A NEW HOOKWORM CURE

A NEW and highly efficient cure for hookworm was described before the recent meeting of the American Society for Tropical Medicine by Drs. Maurice C. Hall and J. F. Shillinger, of the U. S. Department of Agriculture. Dr. Hall is the discoverer of the use as a hookworm remedy of the common cleaning fluid carbon tetrachloride, which has largely replaced the chenopodium oil formerly used. His new discovery is known as tetrachlorethylene. It is somewhat more complex in its chemical structure than carbon tetrachloride, but basically it is somewhat similar to it.

The advantages which Dr. Hall claims for the new remedy, as compared with carbon tetrachloride, are equal effectiveness and greater safety. One spoonful of the older remedy, followed by Epsom salts, commonly suffices to clear up an ordinary case of hookworm. The new treatment requires a dose only two thirds as large. The factor of safety, Dr. Hall says, seems to be very large. Heavy overdoses may cause illness, but in his experiments with dogs he has given as much as one hundred times the curative dose before the animal was killed. In regular medical and veterinary practice, of course, no such overdose would ever be given.

LIGHT-TREATED MILK AS A CURE FOR RICKETS

LIGHT-TREATED milk instead of cod-liver oil is the ''good medicine'' for children announced by Dr. Benjamin Kramer before the American Pediatric Society meeting, held in Washington, D. C.

Rickets, a disease of children's bones due to lack of lime and phosphorus, has long been treated with cod-liver oil, though nobody knew just why. Recently an anti-rachitic vitamin has been shown to exist in the nasty stuff. At the same time researches were going on which have shown that the invisible short-length or ultra-violet light rays have the power to prevent rickets, either by exposing children to them directly, or by exposing certain foods to their action.

Dr. Kramer made a critical test of this action on milk. Eight children who were severely afflicted with rickets were given daily rations of milk which had been exposed for two hours to the action of ultra-violet light from a quartz mercury vapor lamp. X-ray pictures, which Dr. Kramer exhibited, showed that the bones of these children began to heal by the end of the third week of this treatment, and that the cure was well advanced by the end of the fourth week.

The changes in the bones and blood were similar to those which followed the administration of cod-liver oil or the exposure of the child itself to radiations from the quartz mercury vapor lamp.

SCARLET FEVER

SCARLET FEVER, within the very recent past an unconquered scourge of children, has been beaten by means of its own poison. Scarlet fever toxin injected into the skin tells whether or not one is susceptible to the dis-

ease; injected deeper and in larger doses it causes the body to build up resistance against it. The details of the successful campaign against this malady will be told by its conquerors, Drs. George F. and Gladys H. Dick, of the John McCormick Institute for Infectious Diseases, in the next issue of the *Journal* of the American Medical Association.

The Dick test for susceptibility to scarlet fever is not unlike the Schick tests for susceptibility to diphtheria. A toxin solution is prepared by planting the bacteria of scarlet fever in sterile broth, and after a suitable time allowed for their growth, removing the germs and sterilizing the broth by passing it through a porcelain filter. The strength of the toxin must then be tested on human volunteers, for animals can not be used successfully in these tests.

After the strength is determined, a little of the toxin solution is injected into the skin of the suspected person. If no reaction follows, the person is judged immune. If a pinkish or red discoloration the size of a dime or larger takes place, the person is likely to develop scarlet fever in case he is exposed.

Much larger doses of the same kind of toxin are then injected into the subject's tissues. These may cause him to feel vaguely ill, but the malaise soon passes, and in the meantime his system has developed an antitoxin that has destroyed the injected toxin, and has the power of neutralizing the results of any subsequent natural exposures to the disease. Tests since the discovery of this toxin have shown that non-immune persons properly inoculated become immune within two weeks and remain so for at least eighteen months.

The investigators state that an antitoxin has also been developed, using horses' blood, after the fashion of the diphtheria antitoxin. This is now being used with success in the treatment of cases of active scarlet fever. Its use is not recommended, however, for prevention, because the passive immunity conferred is short-lived as compared with the active immunity developed by the use of the toxin itself.

FORESTRY IN PHILIPPINES

THE costly experience of forest destruction in the United States proper is being turned to advantage in the development of the tropical hardwood forests of the Philippines, Major George P. Ahern, trustee of the Tropical Plant Research Foundation, has stated in an interview with a Science Service representative.

Lumber companies operating over large tracts are not being given a free hand with the forests, Major Ahern said, but are granted twenty-year cutting concessions, for which they pay stumpage running from $10 to $20 per acre cut over, and which are renewable if properly handled. The areas granted are large enough so that a given company will require eighty or ninety years to make the first cutting, which gives plenty of time for second growth timber to develop. Complete clearing is not permitted, except where it can be shown that the land is of greater value for farms than for forests. Elsewhere, as a rule, all trees less than sixteen inches in diameter must be left standing.

"When we first started operations," Major Ahern said, "firms with experience in tropical forestry told us that modern logging machinery could not be used. We used it. We put in light railways to bring the timber out, and did away with animal transport and with much of the manual labor. They told us, too, that only the few valuable woods would pay for the cutting. We are taking many other kinds of wood, which are now in high demand for veneer. They told us that a forest so mixed as ours, which comprises at least twenty-five hundred tree species, could not be handled profitably. We studied the possible uses of some twenty odd dominant species constituting about 80 per cent. of the stand, and made tables for the information of engineers and constructors, and now have a good market for everything we take out.

"Philippine mahogany, of course, is one of our best payers. The mahogany cut in Central America averages less than 2,000 feet per acre; Philippine mahogany and a few other woods in some instances run in some areas as high as 40,000 feet per acre. And the Philippine mahogany and the valuable veneer woods are replacing themselves where they have been cut.

"Where the cut-over lands are suitable, Filipinos are coming in and farming them for sugar cane and other crops. At first our concessionaires resented their presence, as 'squatters,' but I pointed out to them that they never held the land more than two or three years, after which the jungle took it back again, and the farmers had to move on to fresh fields. Moreover, the presence of these settlers means a supply of labor, and helps to build up settled communities in the forest country.

"Fortunately, we have no fire problem, other than that incidental to the shifting agriculture above mentioned. The 'slash,' which in the United States would constitute a serious menace, may simply be left on the ground in the Islands, to rot and become part of the soil. The climate is so moist that forest fires have no terrors."

ITEMS

THE Carlsbad caverns of New Mexico shelter a large and interesting population of animals, which was described before the meeting of the American Society of Mammalogists, by Vernon Bailey, of the U. S. Biological Survey, who made a study of them in connection with the recent exploration expedition of the National Geographic Society. In these great caves, and in smaller ones near by, Mr. Bailey found large numbers of bats, together with cave mice, water rats and a rare Mexican animal related to the raccoon, known as the ring-tail. Three species of skunks occupied some of the smaller caves, while gray foxes, bob-cats and mountain lions visited them less frequently. One open cave was used by mountain sheep as a refuge from the weather and from their enemies. Mr. Bailey said that he wished to correct a misimpression that has gained considerable circulation, regarding the cave mice. These animals are neither white nor blind, though they stay in the caves throughout their lives.