SCIENCE NEWS

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MOTION OF THE EARTH THROUGH THE ETHER

EVIDENCE against the validity of the relativity theory was unfolded before the meeting of the National Academy of Sciences by Professor Dayton C. Miller, of the Case School of Applied Science, who, by a much refined and improved repetition of the so-called Michelson-Morley experiment, has shown that there is a definite and measurable motion of the earth through the ether.

Professor Miller has obtained on four occasions a small positive effect at Cleveland, namely, the equivalent of a velocity of about 2 kilometers per second at the altitude of the Case School of Applied Science, and about 3 kilometers per second on the level of the neighboring hills. Whereas at the altitude of the Mount Wilson Observatory in four consecutive experiments spread out over four years he obtained with increasing precision a positive result of 10 kilometers per second, his last result this April justifying him in asserting that the result is correct to within one half kilometer per second.

The technical details of these experiments themselves will be described shortly in special papers by Professor Miller. The purpose of the present note is to say a few words about the implications of these results as viewed from the standpoint of the relativity and the ether theories.

In the first glance then this definite result is entirely antagonistic to the Einstein relativity theory, which in fact could not be adapted to these results of Professor Miller by any conceivable modifications, unless the very fundamental principles of Einstein's theory were given up. This, however, is as much as to say that Professor Miller's results knock out the relativity theory radically.

In the second place, from the point of view of an ether theory, this set of results, as well as all others previously discovered, are easily explicable by means of the Stokes ether concept, as modified by Planck and Lorentz.

Without entering into the mathematical details associated with this statement we may say only that Professor Miller's results as obtained in Cleveland and Mount Wilson are given immediately by the main property of such an ether, namely, to adhere almost completely to the surface of the earth, and therefore share almost entirely its translational motion over its surface and to have a gradually increasing velocity relative to it when we go higher and higher up.

In the third place, the result of the recent rotational terrestrial experiment at Clearing, Ill., near Chicago, which gave a full effect associated with the spinning motion of the earth, can be accounted for by making the natural assumption that our globe, being almost perfectly spherical and having a purely gravitational grip upon the ether, does not appreciably drag it in its rotatory motion. Also the deflection of the light rays around the sun to the amount claimed by the Einstein formula can be easily accounted for by means of a compressible ether provided its dielectric constant is related to its density and pressure by a very simple formula published a few years ago in the *Philosophical Magazine.*

The amount of additional evidence for the reality of Professor Miller's results afforded by his tables showing the relations of the observed azimuths of drift to the sidereal time is very remarkable. These tables indicate a motion of the solar system in a direction and with a velocity in good accordance with the independent results obtained by Dr. Stromberg and others.

THE CAUSE OF VOLCANOES

VOLCANOES are local affairs, comparatively small test-tubes for cosmic chemistry, and not outlets for a vast interior mass of liquid fire deep within the earth. The lava in their boiling lakes is hotter at the top than it is in its depths. And the heating-up process depends partly on oxygen extracted from stones that fall in from the surface.

These and other ideas counter to many old, orthodox notions about volcanoes were presented here at a discussion on volcanism at the meeting of the American Geophysical Union. Dr. T. A. Jaggar, the scientist who chose the rim of the great Hawaiian volcano Kilauea as his dwelling place, led the discussion. Other participants were Drs. Arthur L. Day, F. E. Wright, E. S. Shepherd and R. B. Sosman, of the Geophysical Laboratory of the Carnegie Institution of Washington; Dr. E. W. Brown, of Yale, and Dr. W. M. Davis, of Harvard.

Dr. Day told of the great volume of the rock masses concerned in the great eruption of Kilauea last year, when the old fire-pit in the mountain collapsed and formed a new opening fully ten times the volume of the old, into which something like seven billion cubic feet of rock and gravel disappeared. The shifting of the scene of steam emission, the rifle-like velocity with which great boulders were hurled out, and the fact that the lower parts of the crater were not nearly so hot as the older theories had indicated would be the case led to the conclusion that volcanoes are fed not from one great central shaft, but from a number of smaller, root-like lava channels.

Volcanoes are commonly thought of as growing mountains. Dr. Jaggar declared that they really sink more than they rise. Kilauea, he said, rose during the period 1912 to 1920, but is sinking now. Seismographic instruments indicate also that the mountain tilts from side to side in relatively short periods. The lava in the crater has a fluctuating level, a grand explosive eruption being always preceded by a deep recession of the lava, which apparently allows surface water to enter the hot tube, generating vast quantities of steam.

Dr. Shepherd and Dr. Sosman offered explanations of

some of the puzzling chemical phenomena of volcanoes. Apparently much of the heat that keeps lava liquid and supplies energy for the steam explosions comes from chemical combinations going on near the surface. Carbon monoxide, gaseous sulfur and hydrogen are among the gases present in lava. Present also are the results of the oxidation of these gases, that is, carbon dioxide, sulfur dioxide and water vapor, giving evidence that chemical processes are going on all the time. The source of the oxygen presented a puzzle. It was pointed out, however, that the vast quantities of rock that slide into the crater during a collapse like that at Kilauea last year contain much oxygen combined with iron. The heat roasts out this oxygen, which can then recombine with the other elements.

NIEPCE'S INTERNAL COMBUSTION ENGINE

FRENCH scientific circles have been deeply stirred by revelations just made concerning the possibility of using solid fuel in explosive form for the propulsion of engines and motors. The announcement is based on research into the discoveries of Nicephore Niepce, recorded in the annals of the French Academy of Sciences of almost a century and a quarter ago—a hundred years before the invention of the Diesel internal combustion engine.

The matter was brought before the academy by M. Rateau, leading member and scientist of recognized standing. For clear presentation of the subject the savant exhibited a model of an engine devised by Niepce. This engine was described in the proceedings of a meeting of the academy held on December 15, 1806. The Rateau model was a reconstruction produced by M. Clerget, a well-known aeronautical engineer of Paris.

In the Niepce engine internal combustion was produced by means of solid fuel, instead of oil. The fuel was in powdered form, and it was shown that the engine could function with either lycopodium powder or a mixture of powdered coal and resin. The energy was furnished by a series of interrupted explosions. The records show that Niepce actually applied his motor to the propulsion of a boat against the current on the river Saone.

Rateau sets forth the belief that lycopodium is the ideal combustible. It is composed of spores which are exceedingly small, of regular dimensions and burning rapidly without leaving ash. He expresses the belief that the future holds promise of developing the use of solid fuel in the cylinder motor.

Niepce was one of the inventors of photography with Daguerre. He perfected the system of heliography now used by armies throughout the world.

A NEW SOUNDING DEVICE

PERFECTION of a new sounding device especially designed for the speedy mapping of the ocean floor by means of echoes from the sea bottom, was announced at the recent meeting of the American Geophysical Union, by Dr. H. C. Hayes, U. S. Navy physicist and inventor of the sonic depth finder and other submarine signalling devices.

The new apparatus will be given a rigorous test on the U. S. S. *Dallas* within the next few weeks and is expected to displace the larger and more costly machines now in use.

The present sonic depth finder was not designed for survey work, Dr. Hayes explained, but was originally designed during the war as a means of finding the range of an enemy ship by triangulation. The idea of sending a sound to the ocean floor and determining the distance to the bottom by the time it took to receive the echo was conceived when he was unable to get two ships for experimental purposes as at first planned.

The application of the range finder to survey work was so promising that it was never used for the purpose for which it was built. The new depth finder is similar in operation to the old, but is much smaller and cheaper, as well as more accurate. It is especially designed for survey work.

Dr. George W. Littlehales, of the Hydrographic Office of the Navy, reported to the union that surveys by means of the original sonic depth finder are now being made by the battle fleet operating in the Pacific. These surveys are made in the ordinary course of the voyage and in the last year remarkable results have been obtained in many parts of the world.

Dr. Littlehales told of the discovery of a hitherto unknown bank in the supposed deep China sea by a ship equipped with this device. Another bank was discovered by a ship traveling from Gibraltar to New York, while another vessel quickly demonstrated the non-existence of a bank reported in the Pacific off San Diego, Calif.

Captain J. P. Ault, of the Carnegie Institution, announced plans for the resumption of the cruises of the non-magnetic ship *Carnegie* next year. These plans, he said, contemplated the equipping of the ship with depth finding apparatus and the making of detailed surveys of the bottom. The observations on the variations in the compass will also be carried on, but not so intensively as heretofore. Instead, great attention will be given to the variations in atmospheric electricity and their effect on the fading of radio signals and the differences in radio communication at night and in the daytime.

Dr. T. Wayland Vaughan, director of the Scripps Institution of the University of California, told of the results of research to discover the food value of sea water. Microscopic plants and the minute animals that live on them furnish the food for many fishes. The Scripps Institution is studying the numbers of these tiny creatures in a given volume of water and their relations to the fisheries and the variations in numbers according to temperature, saltiness and other conditions of the sea water.

THE CLASSIFICATION OF RACES BY BLOOD TESTS

BLOOD tests which may show remarkable similarities in heredity between races hitherto considered unrelated were reported by Dr. Reuben Ottenberg, of New York

City, to the American Association of Immunologists meeting in Washington.

Japanese were classed with the South Chinese and Hungarians. Manchurians were placed with the Hindus of India. Senegalese negroes, Madagascans and South Asiatics were grouped together. American Indians and aboriginal Australians were put in the same class; while Spanish Jews showed the same blood characteristics as Arabs, and German Jews were similar to Germans.

These classifications were based on similarities in the proportion of individuals of the four heredity blood types found among large numbers of people from these different regions. Every human being, Dr. Ottenberg explained, has blood of one of four types depending upon the presence or absence of two substances which have been found to be hereditary. One type has substance A. A second type has substance B. A third type has neither A nor B, while a fourth and relatively rare type has both A and B.

The proportion of individuals of the different types, however, varies in different geographical regions, tests made for transfusion operations show. Grouping those regions which showed similar proportions of individuals of the three main types, Dr. Ottenberg formed six classes which he called: European, Intermediate, Hunan, Indo-Manchurian, African-South Asiatic and Pacific-American.

Whether these groups represent biochemical races or show similarities which have arisen in different regions entirely independently, Dr. Ottenberg declared it was too early yet to state. More data from more parts of the earth are needed to complete the blood map of the world or permit any sound conclusions to be reached as to just what these highly interesting findings indicate.

THE MENTAL ABILITY OF CRIMINALS

THAT criminals not only hold their own with the rest of the world in ability to pass mental tests, but even stand a little in advance of it, is made known by an extensive investigation carried on by Dr. Carl Murchison, professor of psychology in Clark University.

Disregarding geographical distribution and basing his conclusions on some thousand cases, Dr. Murchison found that out of every hundred white, native, male criminals, 29 had an intelligence level of C, as measured by the Alpha Army test. This is practically the same proportion of C men found in the white draft, which may be taken as fairly indicative of the white adult male population of the United States. But of the remaining 71 criminals in each hundred, 39 had an intelligence level above C and 32 below C, while for the army out of every hundred only 33 were above C while 38 were below. Unless other conditions account for the differences, the criminals would seem to be slightly better endowed with gray matter than the army men were. Comparison of white criminals for Illinois, Indiana, New Jersey and Maryland separately with the white draft from each state shows similar results.

Dr. Murchison obtained his data in part while chief psychological examiner at Camp Sherman, Ohio. Later he personally tested prisoners in certain prisons in Ohio, Illinois, Indiana and Maryland, and also obtained data on prisoners in New Jersey.

Dr. Murchison discovered that criminals confined within their native states have a lower mental ranking than those who have migrated to other states. He sees in this fact a selective process which keeps men with more alert minds on the move.

He did not find it possible to relate all types of crime to mental levels, but found that crimes of fraud are the especial hobby of superior intellects and crimes against sex of the inferior.

ITEMS

IN anticipation of the nuisance of showers of fluffy "cotton" from the cottonwoods used in many places for shade trees, Dr. W. H. Long, of the U. S. Bureau of Plant Industry, in a statement to the American Forestry Association describes a method for killing the blossoms with a sulfuric acid spray, and thereby preventing the development of the downy seeds later on. The spray consists merely of a two per cent. sulfuric acid solution—one gallon of concentrated acid to forty-nine of water, applied with the usual type of tree-spraying apparatus. Because of its corrosive nature, the liquid should be handled only with copper or brass pumps and other apparatus. Since the "cotton" is produced only by the female, or seed-bearing trees, these alone need to be sprayed. The trees that produce the large, conspicuous catkins, or "red neckties," are staminate or male, and never bear cotton. The pistillate or female catkins are produced on separate trees at the same time as the more conspicuous male clusters, and are much smaller, greenish clusters, protruding very little from the opened buds. These are the ones that need spraying. Treatment of an average-sized shade tree requires from seven and one half to ten minutes of spraying, and consumes ten or fifteen gallons of the solution. The cost per tree varies, ranging from twenty to thirty cents.

GIRLS of active intelligence are not desirable for some kinds of monotonous jobs. In a study of 375 adolescent girls placed in industrial positions, Dr. Emily T. Burr, of the Vocational Adjustment Bureau, has found that "intelligence may be a detriment to steady, efficient work." Bright girls find uninteresting tasks irksome and they become restless and find other employment, thus adding to the large turnover of labor. On the other hand, girls who are assigned to work that is too difficult for them are soon dismissed because of "spoiled goods," "slowness," or "inability to learn job." Girls whose mental age is seven years and six months make satisfactory packers of small articles not easily damaged, such as placing powder puffs in small oiled envelopes. But the packing of fragile hair nets, each of which has to be carefully picked out of a large quantity and folded, demands a mentality of at least nine years and nine months. The simplest sewing machine jobs, such as window shades, are readily handled by girls whose mental age is twelve years. But straight seam sewing and the sewing on of braids and bindings requires an intellectual level of thirteen years.