SCIENCE NEWS

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EARTHQUAKE WAVES

As the surgeon examines the interior of his patient's body by means of X-rays, so are scientists becoming able to study the interior of the earth by means of earthquake waves, produced naturally, or artificially by a dynamite blast. At the meeting of the American Association for the Advancement of Science, the Reverend James B. Macelwane, S. J., of St. Louis University, predicted increasing use of this method that has so successfully been used to locate oil-bearing salt domes.

"There appears to be not only a remote possibility but a high probability of the increasing use of seismic methods for the exploration of the hidden portions of the crust of the earth," he stated. "The prospect has for us a sort of fascination. We are able as it were to hold the earth up to the light and look through it. The earth is as transparent to seismic rays as a ball of glass would be to light. The earthquake or dynamite blast is the flash and the eye we use is the seismograph. So much progress has been made in the last two decades that we may look forward in the next few years to a great increase in our knowledge of the planet on which we live."

Dr. Macelwane also told of the faults, or cracks, that produce such earthquakes as that of San Francisco in 1906, and the fractures that sometimes are caused by the quake.

"Why do such fractures occur?" he asked. "Is there any way of telling where to expect them? In most mountain systems we find faults of this type. Folding and fracture seem to be the ordinary ways in which mountains are built up. Hence we should expect many earthquakes in regions where mountain-building is in progress. Where high mountains are made up of rocks which only comparatively recently were laid down as sediments it is more difficult to see why horizontal movements should occur along nearly vertical fractures.

"However, some explanations have been offered which seem very plausible. If we take a column of rock reaching from one hundred miles below sea-level up to the top of a high mountain chain and take another column of the same cross-section under a level plain or a valley, the mountain column will be much higher and should weigh more than the plain column if they are composed of the same kind of rock. However, the United States Coast and Geodetic Survey finds by careful measurement that the two types of columns in general weigh the same.

"This is stranger than it seems, for let us suppose that the two columns weighed the same a hundred thousand years ago. Every time it rains some of the material is washed off the top of the mountain and some more is deposited on top of the plain as is happening now in the Great Valley of California. As this process goes on, the mountain column should become shorter and the plain column longer. The mountain column should become lighter and the plain column heavier. But again it is found that they keep on weighing the same. This can not be true unless there is some type of compensation going on. There must be a movement of material out of the plain column and into the mountain column.

"If the rocks below the earth's crust were liquid such flow would be easy. But we know from what earthquakes tell us, that the rocks at those greater depths are not only solid but they are more rigid than steel. If they flow, then they must flow as steel does in the die. And if cold rigid rocks flow in this manner, they pull with great force on all the neighboring rock mass with which they are connected and they carry with them in their movement the rocks above them to which they are attached. This is one explanation for earthquake movements of the type we have just considered."

ROTATION OF THE GALAXY

ROTATION of the galaxy—the system of stars of which the sun, the milky way and all the visible stars are part—around a distant and massive center, helps explain the peculiar motions of the bluish-white stars classified by astronomers as type B. This announcement was made to the astronomers at the meeting of the American Association by Dr. J. S. Plaskett, director of the Dominion Astrophysical Observatory, at Victoria, B. C.

Dr. Plaskett explained that the stars of type B, which are classified by the lines that appear in their spectra when their light is analyzed, all are moving from or towards the sun with much smaller speed than any other spectral type. But the curious fact has been found that most are moving from the sun, as if the whole system of these stars was expanding around the sun as a center. The average speed away from us is about five kilometers (3.1 miles) per second.

Though various suggestions have been made to account for this anomaly, such as errors of measurement, Dr. Plaskett has found that most of them agree with what would be caused by a rotation of the whole stellar system.

However, this only explains the motion of the fainter B type stars. Those brighter than the 5.5 magnitude, that is, those closest to the sun, still showed such a motion, even taking into account the galactic rotation. None of the other causes suggested would explain this, he declared.

"It is inconceivable that these causes should not operate in exactly the same way and to the same degree for faint as for bright stars. To imagine any physical property of this uniform class of B stars which depends only upon the apparent brightness, or, in other words, the distance from the sun, an insignificant star in the system, and only about one thousandth as luminous as the B stars, is to carry anthropomorphic prejudices to an absurd degree," said Dr. Plaskett.

Actually, he has found, the closer ones happen to be members of a special group of B stars in the constellations Scorpio and Centaurus, which actually show an unusually high speed for stars of this type. As a result of this work, he has found that the average speed of the

B type stars ranges from about 9 kilometers (5.6 miles) per second for the brighter ones to 12 kilometers (7.4 miles) per second for those fainter and more distant. Great as this speed seems, it is less than the motions of stars of any other type.

SUN-SPOTS AND RADIO

If you think that distant radio broadcast stations have failed to come in as well in the last two or three years as they did in the early days of radio in 1923 and 1924, despite the more powerful stations nowadays, you may be justified. Activity of the sun, as shown by large numbers of sun-spots, was to blame. With a decline in the number of sun-spots scheduled for the next few years, you can look forward to a time of good reception of distant stations, according to Dr. Harlan T. Stetson, director of the Perkins Observatory at Ohio Wesleyan University. Speaking before the astronomers attending the meeting of the American Association for the Advancement of Science, he told of his latest researches on the relation of sun-spots to radio. He began this work at Harvard University in collaboration with Dr. G. W. Pickard, a Massachusetts radio engineer.

A year ago, at the association's meeting in New York, Dr. Stetson predicted that the autumn of 1929 would see a marked increase in the number of sun-spots, associated with poor radio reception on the broadcast bands. This was made on the basis of a regular increase in the spots and decrease in radio intensity that came every fifteen months. He stated that "the radio reception registered in 1929 has tended to follow the same 15-month cycle observed in the sun-spot numbers, with a marked depreciation during the recent fall maximum, when, under normal conditions, radio reception should have been improving with the decreasing hours of sunshine."

Dr. Stetson made the following prediction for the future:

"Forecasting on the basis of the 15-month cycle, the year 1930 should show a general decrease in sun-spot numbers as the year waxes, with a corresponding increase in radio signal strength in the broadcast zone. By the very end of 1930 and the beginning of 1931, the general rise of a secondary sun-spot maximum should be evident. By 1931, however, it is believed that we shall be so far from the maximum of the 11-year period that the secondary maximum will have no effect upon radio reception and allied electro-magnetic phenomena as have the sun-spot maxima of 1928–29. The general lifting of the ionization level in the earth's atmosphere should continue, with the fluctuations noted, through the next six years, but in 1934 solar activity should be as quiescent as at the last minimum of 1923."

Dr. Stetson believes that these radio changes are produced by variations in the height of this ionized layer of the atmosphere, known as the Kennelly-Heaviside layer. Long waves of 18 kilocycles show an opposite effect. Their reception is best when sun-spots are most numerous.

OZONE IN THE UPPER ATMOSPHERE

As one may sleep warmly out of doors under a quilt, or shiver under a sheet, so the upper atmosphere, the stratosphere, is kept warm over Arctic latitudes by a thicker layer of ozone. This was the explanation for a curious fact that has puzzled scientists, given before the American Meteorological Society by Dr. W. J. Humphreys, of the U. S. Weather Bureau.

The stratosphere is the layer of the atmosphere above the highest clouds, and, unlike the lower layers, does not become colder with height. Temperature observations have been made of this layer by means of small balloons, equipped with recording thermometers. "They reveal the curious fact," said Dr. Humphreys, "that the stratosphere is coldest over equatorial regions and becomes gradually warmer with increase of latitude, the extreme difference being around 35 degrees Fahrenheit—coldest over the warmest earth and warmest over the coldest earth."

Though a full explanation has not yet been made, Dr. Humphreys thinks that it is due to the ozone. Observations have shown that there is less ozone over equatorial than over Arctic regions, a fact that is itself yet unexplained. But the ozone absorbs radiation from the earth, and reradiates part of it back again. Therefore, where there is more ozone, more heat is sent back, and so the upper atmosphere there is warmest.

"THE CORNFIELD'S MICRO-CLIMATE"

How a cornfield to a certain extent makes its own weather was related by Dr. J. M. Aikman, of Iowa State College, before the Ecological Society of America, meeting in Des Moines.

As everybody knows, weather has a great influence on crops; but the weather we get from the Weather Bureau might be called just "average" weather. The cornstalk in the field is not interested in averages; what affects its life is how much sunlight reaches its individual self, and to what extent it has to give up, by evaporation, the water it has drawn from the soil.

Dr. Aikman set out to study the "micro-climate" of a cornfield, as affected by the corn plants themselves. He set out instruments to measure the humidity and evaporating power of the air, the temperature of air and soil, and the intensity of sunlight. He measured three different plantings of corn in this way: one a field with two stalks to the hill, one with three and one with five.

In general, he found that the denser the stand the higher the humidity, the lower the evaporation rate among the stalks, and the less sunlight reached the lower leaves. The evaporation rate, for example, was ten per cent. higher in the "thin" field than in the densely planted one. Missing stalks in the hills, causing irregular gaps in the field, introduced wide fluctuations in all the "micro-climatic" readings.

FOODS OF INSECTS

Insects have choices as to what they will eat and what they will reject, no less than humans or horses. Some of them will eat almost anything that they can fasten their jaws on, while others will reject all but a single item on the whole wide world's bill of fare. At a session of the Entomological Society of America, Professor C. T. Brues, of the Bussey Institution, Harvard University, reviewed the varied table manners of different kinds of

insects and discussed the effects of these preferences on man's affairs.

The cockroach, one of the most ancient and primitive of all insects, is also one of the least "choosy," Professor Brues said. It will eat almost anything, either vegetable or animal, but other insects equally ancient, like the dragonflies, already show special preferences, sticking strictly to a diet of freshly captured insects. Some of the later-developed insect groups show a gradation in choice within a single family or genus. Some species of wasps, for example, are willing to use a variety of spiders and insects in provisioning their nests, while others depend on a single species to supply them with meat.

The same is even more strikingly the case among plant-eating insects. Everybody knows how thoroughly grasshoppers strip vegetation, and in the East the Japanese beetle is establishing a record almost as bad. Others again will feed on a number of different plants, as the gipsy moth caterpillar feeds on several kinds of shade trees; but these have a more limited number of host plants.

Among the worst of the pests man has to deal with are insects so highly specialized that they can not or at least will not feed on anything but one kind of plant. The potato beetle and the cotton boll-weevil are high on this "bad eminence." It is largely against them that quarantine barriers are erected, and for their undoing that entomologists comb the world seeking other insects that will kill or weaken them or prey upon their eggs and young.

PLANT MIGRATIONS

THE classic boast of the old cowboy song, that "I've swum the Mississippi and I've clumb the Great Divide," is true for rooted plants no less than for beings blessed with means for bipedal locomotion. Plants also climb the Great Divide, Professor Aven Nelson, of the University of Wyoming, veteran western botanist, told members of the American Association for the Advancement of Science. One of these passes accessible to plants is in Yellowstone National Park.

"A certain small area in Yellowstone Park," said Professor Nelson, "is a sort of 'no man's land' out of which the headwaters of three great river systems spring—the Yellowstone, the Snake and the Green as important tributaries of the Missouri, the Colorado and the Columbia system. It is to be remembered that the watershed divide does not necessarily coincide with the high peaks and ranges. The Continental Divide in certain places is found on high table-lands so level that only the observed drainage or the surveyor's instrument can locate it.

"These high table-lands, often of great extent, lying between the interrupted ranges, constitute the passes that permit the construction of great roadways connecting the East with the West—the Union Pacific Railroad, the Lincoln Highway and the Transcontinental Airways, for instance. It may be well also to remind ourselves that these passes permit not only the mingling of peoples but of plants. Were the barriers more complete we could speak more definitely of a Pacific and an Atlantic flora.

"It is no longer true of either flowers or folks, that 'The East is East, and West is West, and never the twain shall meet.' Modes of travel to satisfy their wanderlust were devised by plants long before we ever dreamed of automobiles and airplanes. The embryos of the cocklebur and cottonwood tree ride and fly with more security than we."

But although native plants have been using these passes for thousands of years, the number of introduced weeds is as yet comparatively small, Professor Nelson added. This is because, measured by the years of its settlements, this area is young.

"Man is usually the responsible agent for introductions," he continued. "Waifs and adventives follow his adventuring as do inappropriate common names. He drags plants and names in, figuratively by their heels and literally on his own."

ITEMS

NAVAJO Indians employed in road work in Mesa Verde National Park saved for the park its one and only elderberry bush, which had to be moved from its old location to permit the construction of a portion of the scenic Knife Edge road. The Navajos channeled about the roots of the bush so that it would be moved in a large block of earth. Then when the new hole was made, cables were adjusted, hooked over the shovel teeth, the bush raised, taken by shovel to the new location, and reset. The bush, a very fine and large specimen, was then cut back approximately forty per cent. to insure its future growth.

A STUDY of the bacteria that cause the peculiarly unpleasant musty odor sometimes found in eggs was reported to the Society of American Bacteriologists meeting at Ames by Max Levine and D. Q. Anderson, of the Iowa State College. The organisms causing the mustiness have been isolated and their characteristics were described at the meeting. The development of mold on the shells of eggs in cold storage depends on conditions surrounding the eggs previous to storage, L. H. James and T. L. Swenson, of the U. S. Bureau of Chemistry and Soils, reported at the same session. Chief among these conditions was the shipment of eggs in unseasoned wood.

THE partial sterilization of soil by heat has recently been investigated by Dr. W. F. Bewley, director of the Experimental and Research Station at Cheshunt, England. Dr. Bewley finds that the heat not only destroys pests and diseases but also greatly increases soil fertility and encourages the production of healthier plants. Soils are heated for about half an hour at the temperature of boiling water. Heavy soils require more heating than light sandy soils. The bacteria and fungi which cause diseases in plant roots are destroyed, but the beneficial soil bacteria are not killed and have fuller scope for their development. The heat also causes complex organic and inorganic substances to be converted into simpler substances which are more useful for the plant and the soil bacteria.