SCIENCE NEWS

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TOTAL SOLAR ECLIPSES

LAST-MINUTE calculations made at the Nautical Almanac Office of the U. S. Naval Observatory by Dr. James Robertson, director of the Almanac, show that the total eclipse of the sun on August 31 will be visible slightly to the west of the path in New England previously forecast for it. The earlier prediction was made in 1929 and published at that time. However, the motions of the moon, which cause an eclipse when that body comes in front of the sun, can not be predicted with absolute precision. For that reason, Dr. Robertson has made use of the latest observations of the moon's position to recompute the circumstances of the eclipse. The latest of these were made on April 20, so that the moon will only have a little over four months in which to wander.

The newly computed path is about seven tenths of a mile farther west than the previous one, but as it is about a hundred miles wide, any one who has selected a point near the center, from which to observe the eclipse, will still be practically as well located. In southern Maine and eastern New Hampshire, where the total phase will last one minute and thirty-eight seconds, on the center line, the duration ten miles away will be only two seconds less, and even forty miles away it will still be more than a minute.

Many scientific parties have selected the vicinity of Conway, New Hampshire, and Fryeburg, Maine, for their observing stations. According to the new calculations, the center line passes just half way between these two towns, which are seven and a half miles apart. North Conway and Center Conway are almost exactly on the line.

After this eclipse Americans must wait 31 years before another suitable shadow of the moon cuts off the sun's light. A total solar eclipse visible from the United States will occur July 20, 1963.

Relying on preliminary charts made by the German astronomer, Oppolzer, some fifty years ago, astronomers have hitherto believed that the next U. S. total solar eclipse would not occur until 1970, but Professor Robertson, by using more refined computations, has shown that this is not the case. In addition to the 1963 eclipse, there will be total solar eclipses visible from this country on March 7, 1970, and on February 26, 1979.

By a coincidence the 1963 eclipse will have its band of totality sweeping across nearly the same area as the eclipse of August 31 of this year. Its path will be about one hundred miles wide and will pass over northeastern Vermont, northern New Hampshire and southwestern Maine. It will include Montreal, Canada, and Augusta and Portland, Maine. Its maximum duration will be about 1 minute 40 seconds.

The 1970 eclipse will last about 3 minutes and pass over the middle of the Florida peninsula near noon when the sun is overhead. The eclipse of 1979 will last about 2½ minutes in its total phase and will have its path of darkness extending south of the Canadian border for nearly a thousand miles from the Pacific coast eastward.

The eclipses of 1963, 1970 and 1979 will be observable near the center of their paths in the United States, the most favorable position for astronomers. Other total eclipses of the sun, on July 9, 1945, and June 30, 1954, will begin in the northwestern part of the United States but will pass into Canada within a few minutes. It is not expected that these eclipses will be of great astronomical interest.

Astronomers who travel long distances to observe the atmosphere of the sun which is visible as its corona only during fleeting moments of eclipse will need to wait only until February 14, 1934, when a total solar eclipse will be visible from a small island in the Pacific Ocean. Other eclipses will occur on June 19, 1936, visible from Japan, and on June 8, 1937, visible from in the Pacific.

THE SPEED OF ROTATION OF THE SUN

FOR many years astronomers have known that the sun varies in light over an eleven-year period, as the sunspots wax and wane. The suggestion that it also varies in the speed of its rotation, but in a period of about thirty years, has been made in a report to the Royal Astronomical Society by John Evershed, following researches made in his private observatory in Surrey.

The sun's rotation speed varies in different latitudes. At its equator it turns most rapidly, rotating once in about 24.65 days, but towards the Poles, the solar surface lags behind. At latitude 35 degrees, the rotation is once in 26.63 days. Dr. Evershed's study is concerned with the sun's equator, where the speed of the surface is about a mile and a quarter, or two kilometers, a second. His observations were made by photographing the edge of the sun with the spectroscope. By measuring the shift of the dark lines which appear in such photographs, the motion towards or away from the earth can be determined.

The mean value of eleven such measures, as made over a period from July to December, 1931, is 2.015 kilometers per second, a value which may be in error as much as .026 kilometers. Previous determinations by other astronomers with similar means have given different values. Those made before 1911 gave values over two kilometers per second, while those made after 1915 gave between 1.90 and 1.94 kilometers per second. A series made by Dr. Charles E. St. John, of the Mount Wilson Observatory, beginning in 1914, showed close agreement, with a minimum of 1.90, until 1929, when there was a tendency for the value to increase, 1.95 being obtained. Dr. Evershed's new results, with a value in excess of two kilometers a second, a return to the measures made between 1900 and 1911, indicate that the change in speed actually occurs.

A NEW VACCINE FOR TYPHUS FEVER

A NEW vaccine which promises to give protection against the endemic typhus fever of the United States has been developed at the U. S. National Institute of Health by Drs. R. E. Dyer, W. G. Workman, A. Rum-

reich and L. F. Badger. The vaccine, made in the same way as was that for Rocky Mountain spotted fever, has been successfully used to protect guinea-pigs against typhus, and when further perfected it will be used on human beings. The first persons to be given it probably will be the group of men who have developed it, thus following the usual custom of scientific men of trying their new products on themselves first.

The vaccine was made from typhus fever-infected rat fleas. The fleas were mashed up in a salt solution. Carbolic acid was then added to the emulsion and the whole mixture allowed to stand for five days. This weakened the typhus germs so that they were no longer capable of causing typhus fever to develop, yet were able to stimulate the body's specific powers of resistance to the disease. About half of the guinea-pigs receiving the vaccine developed resistance, or immunity as the scientists call it, to typhus fever within two or three months. By using a stronger virus from which to make the vaccine, Dr. Dyer and associates hope to give a higher degree of protection against the disease.

Typhus fever in the United States is much milder than the disease as it occurs in European countries. There it is highly fatal and occurs where crowding or poverty or other factors produce unsanitary conditions. It frequently follows wars and was very prevalent after the last war. In this country it is not fatal, although it is an illness lasting from two to three weeks. It was once thought to be the same as typhoid fever, but in the middle of the nineteenth century the two diseases were distinguished.

Typhus fever is caused by a virus which is transmitted in the United States by the rat flea. In Europe it is caused by a slightly different strain of virus and is transmitted by the body louse. Forms of typhus very similar to the American have been reported from Australia, South America, Mexico and the Dutch East Indies. Dr. Dyer hopes to get strains of the virus causing the disease in these countries to determine whether it is the same as the American.

DIAMONDS AND ELECTRICITY

INVESTIGATIONS are being made of the behavior of certain rare types of diamond, which are transparent not only to ordinary light but also to ultra-violet down to a wave-length of 2,300 Ångstrom units, and to infra-red heat rays of 8,000 Ångstrom units (an Ångstrom unit is about four billionths of an inch). These diamonds, of which only very few are known, give an electric current when illuminated by certain kinds of light.

Sir Robert Robertson, chief chemist to the British Government, reports that out of some 250 diamonds that he has tested only five have shown the power to generate an electric current. He believes that he can now recognize such diamonds in a simpler manner from their behavior in polarized light.

Sir Robert showed a photosensitive diamond recently before the Royal Society of London. The precious stone was clamped between two carbons. Brass or lead can also be used to make electrical contact. When illuminated by ultra-violet or by extreme red light it gave an electric current that produced a deflection in a galvanometer, so long as the light shone on the diamond. This photoelectric effect is different from that which occurs in the "electric eye" instruments, where electrons are dislodged and thrown out into vacuum by the impact of light rays or quanta upon certain sensitive metals.

A curious fact in the light-sensitivity of the transparent diamonds is that the electric current produced by the ultra-violet rays of wave-length 2,300 Ångstrom units can be quenched by light of wave-length 3,650 Ångstrom units and thereafter the diamond is no longer affected by the rays of the extreme red spectrum, though retaining its sensitivity to the ultra-violet variety.

EMPLOYMENT OF JOBLESS IN NATIONAL FORESTS ADVOCATED

WHILE citizens in western states are fighting forest fires, insects and diseases and doing other conservation work without pay, the American Forestry Association is fighting for inclusion in the Wagner unemployment relief bill amendments which will employ men on such public work for remuneration.

George H. Collingwood, of the American Forestry Association, estimates that the protection-conservation program of the nation has been curtailed for 1932–33 to the extent of several million dollars, as well as an unlimited amount on its purchase plans. He points out that the Biological Survey in its research and predatory animal control work will be working with a greatly reduced budget this year. Likewise the Bureaus of Plant Industry and Engineering in the U. S. Department of Agriculture. National Park and Forest projects have also been put "on ice," despite the low cost of land and labor at this particular time. The work of establishing migratory bird refuges, so that hunting enthusiasts may not find their sport an empty one in years to come, is practically at a stand-still.

For the work of protecting forests belonging to states and private parties, the federal government plants to give $1,600,000 in 1933; states and private owners are expending about $4,400,000; and if the Wagner bill will add $3,500,000, as proposed by the American Forestry Association, to be loaned to states for this purpose, it is believed that a fairly satisfactory program could be undertaken. Most of the money would go for labor, it is estimated; and circulation of this would begin in from ten to sixty days.

The Wagner bill is sure to provide $5,000,000 to be loaned to states for protection and improvement of forest roads and trails in the National Forests, and efforts are being made to increase this to $25,000,000.

It is pointed out that while forest conservation work can not come under the head of strictly self-liquidating projects, indirectly its importance to the wealth of states and communities can not be overestimated.

Congress authorized some time ago the purchase of 1,713,610 acres additional lands in northern Minnesota to be a part of the Superior-Quetico National Forest. Only 127,901 acres of this land has been approved for

purchase at an average price of $1.81, and no additional land will be bought in 1933, because of the government's economy program. Another area in Minnesota, known as the Mesaba Range, was planned to be added to national forest lands, but title to none of its 171,000 acres will be vested in the government this year. The policy of the United States at present is, despite low purchase costs now available on property, to use public funds only for such projects as will employ labor.

ARSENIC FROM THE BOLIDEN MINE

THE Boliden mine in northern Sweden is expected to bring that country to the position of the largest producer of gold in Europe, among the first ten in the world, with an annual output of about 320,000 ounces. To achieve this position, however, the company, in operating the mine, must also produce copper and silver, selling at low prices, and a large amount of arsenic, 55,000 tons of the oxide per annum. The oxide is the form in which the metal is freed during roasting operations. Being intensely poisonous, the fumes can not be allowed to escape into the atmosphere, so the dust is settled by electrostatic precipitation.

The entire world consumption of arsenical poison could be supplied from this mine, so an accumulation is inevitable. The problem of disposing of this by-product surplus after commercial demands had been met proved difficult. At first the white arsenic, as it is called, was mixed with the ingredients for concrete, and the shapes were sunk in deep water in the Gulf of Bosnia, where the smelter is situated. The company soon decided that a continuance of this plan was costly and undesirable, and storage has now been provided for 120,000 tons—a stock that will prove a menace to producers in other countries, for the Boliden arsenic can be sold to the company's advantage at a nominal price.

Arsenic, although useful in medicine, is a cumulative poison when taken accidentally or administered with criminal intent. It is without taste or smell, so may be administered without exciting suspicion or causing noticeable diagnosable symptoms. For this reason, some of the famous poisoners of history have used arsenic. In the English Maybrick case, the victim was dosed for several weeks with small amounts of solution obtained by soaking poison fly papers in water.

White arsenic, the oxide, and various arsenates and arsenites are used mainly for the destruction of animal or vegetable pests, and for the preservation of building materials. The source is usually one of the many complex sulphides, often associated with iron, copper and silver. As an addition to lead, arsenic acts as a hardening agent, making the metal more suitable for shot. Other limited applications for alloying purposes are known. Research may disclose new industrial uses.

ITEMS

THE tracks of the intensely penetrating cosmic rays, recently photographed for the first time, occur in groups of two or three, apparently radiating from one point, more often than can be accounted for by chance, according to Dr. Gordon L. Locher, of the Rice Institute. His discovery has been reported to the American Physical Society through *Physical Review*. Dr. Locher concludes that these tracks are not actually the paths along which the cosmic rays travel on their way in from the depths of space. The incoming cosmic rays are, he believes, probably photons or wave-light rays which strike an atom to produce two or three speeding electrons simultaneously. The paths of these secondary electrons produce the tracks that can be photographed. If Dr. Locher is right in his interpretation, his experiments will help to settle the much-disputed question as to whether the cosmic rays are moving particles or wave-like rays much shorter than x-rays. Electrically charged particles produced in the air by the cosmic rays are much less numerous per inch along the tracks than had formerly been believed. This fact clears up the difficulty that the number of charged particles produced by the rays could not be reconciled with the ability of the rays to pierce the earth's atmosphere so effectively as they do.

THE eagerly awaited results of the biological work undertaken by Drs. F. P. Bowden and C. P. Snow, of the University of Cambridge, can not give the final proof that the carrot pigment, beta-carotene, has been changed into the growth-promoting vitamin A according to Professor I. M. Heilbron and Dr. R. A. Morton, of the University of Liverpool, writing in *Nature*, because carotene itself is transformed into vitamin A in the living body. Drs. Bowden and Snow believe that they have obtained vitamin A by the action of ultra-violet light on carotene, but, according to Professor Heilbron and Dr. Morton, this could only yield hydrocarbons, that is, substances made up of hydrogen and carbon only. It could not give vitamin A, which contains in addition oxygen in the form of an "alcohol group" (OH). Another test on the power of absorption of light of wavelength 3,280 Ångstrom units, is not considered conclusive evidence, because iso-carotene, a colored substance readily obtained from carotene, has a sharp absorption band in the neighborhood of 3,200 Ångstrom units and similar substances other than vitamin A may be responsible for the absorption observed.

NERVES achieve their effects by means of special hormones which they produce, instead of by direct action on muscles and glands. This is the latest theory of physiologists. Further evidence in support of it was presented by Dr. B. P. Babkin and his associates, Drs. Armine Alley and George W. Stavraky, of McGill University, to the Royal Society of Canada meeting at Ottawa. These investigators found that, under certain conditions, stimulating the nerve of the salivary gland on one side of the mouth produced increased activity and secretion by the salivary gland on the other side. Under the conditions of their experiment, there could be no direct nervous connection between the two glands. This strongly indicates that the nerve itself produces a hormone which acts on the secretory cells of the corresponding gland and reaches the opposite gland by the blood stream.