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SUNLIGHT AND VITAMIN "D" IN EGGS

"EGGS from sunkist hens — Keep the kids' legs straight." Such or similar may soon be the type of advertisements we shall see in the market place. Whether or not an egg contains vitamin "D," the substance that prevents "weak legs" in chickens and rickets in children, depends on the kind of life the hen that laid it has led. If she has been an out-of-doors hen, getting plenty of sun baths, or even if she has been getting daily doses of ultra-violet light from quartz mercury vapor lamps, she will produce vitamin "D" eggs. But if she has lived a sheltered life in a glass house, her eggs will be of no use to prevent rickets.

Experiments conducted under the direction of J. S. Hughes, professor of chemistry at the Kansas State Agricultural College, give evidence for these conclusions.

An egg a day was included in a ration deficient only in vitamin "D" which was fed to forty-eight chicks divided into lots of a dozen each. Chicks fed on eggs laid by hens that had received both sunlight and artificial ultra-violet light grew up thrifty fowls without any indication of weak legs.

Eight of the twelve chicks whose diet included an egg a day from hens which had been kept in a room lighted only by glass windows but which received ultra-violet light treatment one half hour daily developed mild cases of rickets. They were able to stand but had weak legs.

A third pen of chicks got eggs from hens which had received plenty of sunlight, but no ultra-violet light treatments. These chicks were thrifty.

All the chicks in the fourth pen contracted rickets and four of the lot died. Their diet included an egg a day from hens which received no direct sunlight but all the sunlight that penetrated a large south glass window. The glass in the window filtered out the ultra-violet light, the part of the sun's rays that is responsible for the production of vitamin "D" in the egg.

Vitamin "D" is stored in the yolk of the egg, it was shown by a supplementary experiment with chickens conducted by the department of chemistry.

SMELTER ELIMINATION

A PROCESS eliminating the smelter from the process of changing iron ore into steel and employing the direct reduction process of iron ore to iron without smelting has succeeded in American laboratories, is now in use by a company at Oviedo, Spain, and is being perfected at the University of Minnesota Mines Experiment Station with a view to its introduction at the northern Minnesota mines.

Low-grade ore, containing 30 to 45 per cent. iron, and low-grade fuel, such as North Dakota lignite, can be used in the process, according to specialists at the Minnesota station. Large savings will be effected, first, by using the cheap fuel, and, second, by eliminating the shipment of the large percentage of waste matter that must be moved as part of low-grade iron ore.

The ore is placed in one end of a long, rotating tube and the fuel, in gasified form, is forced into the other. A temperature of 1,800 degrees Fahrenheit is maintained and air is excluded. The fuel burns by combination with the oxygen of the ore. When combustion has been completed only silica remains as a foreign substance, mixed with the metallic iron, and the iron is separated from the silica by magnetism or some other physical process. The temperature at which this takes place is not sufficient to melt the ore, and it is unchanged in structure when taken out, although its color has changed from red to black. The metallic iron is then agglomerated into briquets by pressing, so that it will be easier to handle.

It is claimed that perfection of the process on a commercial scale will provide the most important method yet developed of utilizing the low-grade ore of the Minnesota and Michigan ranges, estimated to exceed 1,000,000,000 tons, of which almost none is now used in the iron and steel industry.

SETTING A WATCH BY THE STARS

IF you are out of doors on a clear night, and your watch has stopped, you can set it to an accuracy of within 15 minutes of the correct time by looking at the northern sky. Of course, the astronomer always finds his time by stellar observations, but this gives him star or sidereal time, and complicated tables are necessary to change this to the solar time which is in common use. By a method recently developed by Dr. Charles C. Wylie, assistant professor of astronomy at the University of Iowa, with the cooperation of Dr. W. W. Merrymon, of Bloomfield, N. J., approximate solar time may be found from the stars with relative ease.

"Consider the northern sky as a huge clock face," says Dr. Wylie, "with the Polar Star at the center and the pointers of the Dipper as the hour hand. The numeral six will be directly below the Pole Star and twelve directly above. Then read the indicated time. With a little practice this can be done to the nearest quarter hour. To this figure add the number of months that have elapsed since January first, to the nearest quarter month; double this, and subtract the result from sixteen and a quarter. If the result is more than sixteen and a quarter, subtract this result from forty and a quarter. This answer is the time in hours P. M."

As an example, take an evening late in September. The pointers are in the position of a clock hour hand at seven o'clock. Eight and three quarters months have elapsed since New Year's day, which is added to seven, making fifteen and three quarters. Doubled, this is thirty-one and a half, which, subtracted from forty and a quarter, gives eight and three quarters, or 8.45 P. M. This is solar time and, of course, does not take daylight saving time into consideration.

WORLD CULTURE 5000 YEARS AGO

THAT the East and the West met as long as 5,000 years ago and that a fairly identical culture extended at the

end of the stone age from Sicily in the Mediterranean through Egypt, Greece, Mesopotamia, Southern Russia and China as far as the Pacific coast is the claim of the Swedish archeologist, Professor J. Gunnar Anderson, who recently returned to Stockholm after serving eleven years as official mining adviser to the government of China.

In cooperation with the Chinese authorities, for which he has the highest praise, he has explored the prehistoric cities of northern China, and after dividing his finds equally with the University of Peking, he has sent home during the past few years no less than 2,200 cases containing fossils, as well as contents of graves, chiefly pottery articles, which show that the inhabitants of China about 3,000 B. C. practiced virtually the same arts as did the peoples living in southeastern Europe and southwestern Asia.

Until Professor Anderson began his excavations the easternmost point at which traces of this common European-Asiatic culture had been found was at Anau in Russian Turkestan, but now they have been located within thirty miles of the Pacific coast in China as well as in southern Manchuria.

It was in 1914 that Professor Anderson obtained leave from the University of Stockholm to become adviser to the Chinese government, and from 1915 to 1919 he was occupied chiefly with technical geologic work in locating mineral deposits. At the same time he observed the opportunity for archeological explorations and in 1918 he obtained the necessary permits. Part of the expenses, amounting to more than $100,000, have been paid by the Swedish government and part by a Swedish-China Committee of which the Crown Prince of Sweden is chairman.

INCREASE OF THE INDIAN POPULATION OF THE UNITED STATES

CONTRARY to widely circulated reports that the "American Indian is dying off at an alarming rate in the great southwest," the Pueblos and other Indian populations are holding their own and increasing at a rate nearly as high as that shown by census figures for the white population.

Dr. Edgar L. Hewett, director of the School for American Research of the Archeological Institute of America at Santa Fé, New Mexico, has transmitted to the American Association for the Advancement of Science a report of a census just made that shows that in the last decade the population of Pueblo villages has increased 22.2 per cent. and now totals to 10,565. Only one Pueblo showed a decrease, and that was due to an influenza epidemic a few years ago.

During the same period the entire population of the United States increased 39 per cent., part of which was due to immigration. These figures Dr. Hewett considers adequate refutation of the general idea that there has been a "startling decrease in our primitive population."

"On the question of the Indian ceremonies, also, much emotion has been wasted," Dr. Hewett said. "They are vital in the life of the Indians. They are highly esthetic in character, and are not attended by as immoral consequences as are the social dances of the whites. Nor are the ceremonies dying out, nor are they likely to. On the contrary, ceremonies that had disappeared are being revived every year and the Indians are preserving their own self-respect by cherishing their native culture which has in it elements of nobility worthy of any race. There is no religious persecution of the Pueblos, no effort is being made to suppress their dances unless pernicious features crop out, and in such cases the Indians are more amenable to advice than are the youth of our own race."

SHADOW BANDS

THE cause of the shadow bands, elusive ripples of light seen just before and just after a total eclipse of the sun, and which were particularly apparent at the eclipse of last January in New York and New England, the path of the next such eclipse visible in the United States, and the results of a New York electric light company in determining the southern limit of the path of totality last January; these were some of the subjects discussed by the members of the American Astronomical Society who met recently at Carleton College. Dr. Charles Clayton Wylie, of the Iowa State University, announced the results of his study of the shadow bands and, in his opinion, they are due to irregularities in the atmosphere. "If the light from a bright star, such as Sirius, is allowed to fall on a white surface in an otherwise dark room," said Dr. Wylie, "a person of keen eyesight may see a pattern of light and dark mottlings, because the source of the light is a point. Ordinarily in sunlight these mottlings are not seen, because the patterns overlap, but at the time of an eclipse, just before and just after the moon covers the sun, a narrow sliver of light remains, which is practically a line, and so the overlapping is in one direction only and the effect may resemble the stripes in a flag."

In confirmation of his ideas, Dr. Wylie quoted results of observers at the January and other eclipses, which showed that the shadow bands are usually parallel to the direction of this narrow edge of the sun. At New Haven, Conn., Poughkeepsie, N. Y., and other points along the path of the eclipse last winter, the bands were seen for many minutes before and after totality. They resembled the pattern seen on the bottom of a sunlit pool at first, and moved with the winds, but as less of the sun was seen they became more like stripes. This effect is supposed by Dr. Wylie to have been due to an unusually disturbed condition of the atmosphere over the cities, as a result of the warm air from chimneys.

The next total solar eclipse will be in Sumatra next January and already astronomers from Swarthmore College, the U. S. Naval Observatory and the Mt. Wilson Observatory have sailed to observe it, but before many years have elapsed people in the northeastern part of the United States will again have an opportunity of witnessing this rare phenomenon. On the thirty-first of August, 1932, a total eclipse will occur and pass through parts of Vermont, New Hampshire and Maine. This eclipse will start near the north pole, and the path of totality will enter the country in northern Vermont, and will leave across the Atlantic Ocean between Portland, Maine, and Portsmouth, N. H. As this will occur about half past three in the

afternoon, the chances for clear weather should be fairly good.

The sun is evidently not slowing up in its period of rotation, as some astronomers have supposed, even though a series of observations made with the spectroscope of the outer layer, the chromosphere, reveal a slower speed in 1919 than in 1906. This was discussed by Dr. Charles E. St. John, of the Mt. Wilson Observatory. Dr. St. John believes that this is due to the fact that the material around sun spots rotates in different directions at different times. Once every eleven years the spots become very numerous, and then become scarce again, but it has been found by Dr. George E. Hale, former director of the Mt. Wilson Observatory, that in each period the spots behave differently from what they did before. In one period, the westerly spots, for they appear in pairs, are always electrically positive in the northern hemisphere of the sun and negative in the southern, while eleven years later this is reversed. As this also affects the direction of the whirling of the sun's surface, for the spots are really solar whirlwinds, Dr. St. John believes that it might account for the different speeds which have been found, but it will be necessary to study them for two more cycles, or twenty-two years, before the problem is definitely settled!—*James Stokley.*

WHAT MAKES WATER FLOW UPHILL?

STATE a paradox and people will stop and stare. Repeat it a thousand times and nobody will pay any attention.

The ascent of sap in plants is so commonplace an occurrence that we seldom stop to consider what a truly amazing thing it is. Here is an apparent contradiction of the law of gravitation, going on all about us all the time. On every summer day, in every field and woodlot, water flows uphill, whether only a fraction of an inch in the humble mosses or a couple of hundred feet in a towering tree. A single full grown maple or linden will evaporate from its leaves as much as a barrel of water in a single day, and this must of course be replaced by sap flowing up the trunk. The water sent into the air by all the plants combined, must be comparable in quantity with the water carried off by the rivers.

How the water gets uphill in the trunks and stems of trees and plants has long been a sore puzzle to scientists. Several theories have been proposed; none of them is very satisfactory. Until recently the one most commonly favored was known as the theory of "capillarity," which assumed that the water rose in a stem much as oil rises in a wick, through the natural tendency of liquids to climb up in narrow tubes and crevices. The trouble was, however, that ordinarily capillary attraction could not raise water high enough or fast enough to account for all the losses through evaporation and use within the plant. Then there was another theory that took into account a supposed pumping action by the roots, or a so-called "root pressure." This theory, however, was always very vague, and even those who claimed to understand it could not explain it very convincingly.

A comparatively recent development is a theory that seems to explain the phenomenon and at the same time to be free from the objections that have overthrown the earlier ideas. This theory is largely the outcome of experiments by a British scientist, Professor Dixon. He found that by sealing a column of water in a glass tube and using appropriate experimental means, he could make the water carry a considerable weight without breaking. Ordinarily, of course, we think of a stream of water as a thing as unstable as a rope of sand, but the trick seems to lie in getting rid of all the air; for when this was done the water column could support a strain of several hundreds of pounds per square inch.

This is exactly the condition we find in the stems of plants. The fine fibers of which all stems are largely made up are really exceedingly slender tubes, in which water is carried as sap, but from which all air is excluded. These tubes are connected with each other from the ends of the remotest roots to the edges of the topmost leaves. It is thus possible to think of the evaporation from the leaves setting up a strain or pull on the water in the tubes, which is transmitted as through a system of slender silver wires, drawing the water up as rapidly as it is needed, and even reaching out into the soil in contact with the roots and obtaining a fresh supply from outside.—*Frank Thone.*

ITEMS

DISCOVERY that a small snail causes the root-rot disease, which has almost wrecked the sugar-growing industry of Louisiana, is announced by Dr. E. W. Brandes, plant pathologist of the U. S. Department of Agriculture. Hitherto the mollusks, to which order the snails belong, have remained unconvicted as crop criminals. Dr. R. D. Rands, of the Office of Sugar Plant Investigation, however, found that *Zonitoides arboreus,* a snail so tiny that it easily travels through the tunnels made by earthworms, attacks the cane roots. As many as 150 of these little snails have been counted about the roots of a single plant. In their attack they leave minute cavities which are invaded by microorganisms from the soil. These latter complete the injury and often kill the plant. It is estimated that there is a reduction in crop tonnage of at least twenty per cent. directly traceable to the subterranean attack made by these snails whose sweet tooth is literally cutting off the Louisiana cane industry at the roots.

THAT exposure to the ultra-violet rays first increases and then destroys the potency of insulin is the report of Drs. M. M. Ellis and E. B. Newton, of the University of Missouri, to appear in a forthcoming issue of *The American Journal of Physiology.* An accepted grade of commercial insulin was exposed to the action of ultra-violet rays from a powerful mercury vapor lamp for periods of time up to forty-eight hours. The insulin was exposed in an atmosphere of nitrogen in order to eliminate free oxygen and ozone, for it has been shown that insulin is destroyed by oxidation. It was found that exposures for more than four hours destroyed the power of insulin to reduce the sugar content of the blood and the longer exposures even produced an opposite reaction, increasing the sugar content. On the other hand, exposures of less than four hours seemed to increase the potency of the insulin, adding to its power to reduce the concentration of blood sugar.