SCIENCE NEWS

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THE URBANA MEETING OF THE NATIONAL ACADEMY OF SCIENCES

LEAVES are by no means 100 per cent. efficient in their work of making food with the aid of captured sunlight. In addition to giving off as lost heat a part of the energy they absorb, they also fail to absorb part of the light that falls on them, simply throwing it back by reflection. Researches on this reflection loss by leaves were reported to the meeting of the National Academy of Sciences by Professor Charles A. Shull, of the University of Chicago. Different leaves reflected different proportions of the light that fell upon them and the same leaf reflected light of different colors in different percentages. Thus, the upper surface of a silver poplar leaf reflected 7.5 per cent. of one of the violet hues, and 20 per cent., or nearly three times as much, in the yellow-green part of the spectrum. The upper and lower surfaces of the same leaf have very different reflecting powers. The same silver poplar leaf, which is dark green above but shining white beneath, reflected 8.5 per cent. of the deepest red rays from its upper surface and 50 per cent. of the same rays from its under side. Autumn coloring had a great influence on the reflecting power. The red leaves of the woodbine reflected nearly twice as much red light as they did of violet; but their total reflection was far less than that of the bright yellow birch leaves, which reflected over 40 per cent. of the incident light, as against only about 13 per cent. for the woodbine leaves.

WHAT is the destiny of prairies? What would have become of the great stretches of rolling grassland that began in mid-Illinois and stretched across Iowa and Minnesota and into Nebraska and Kansas if they had not been plowed into corn and wheat fields? These questions, which have been much discussed by botanists and have considerable practical significance in agriculture and forestry, were discussed by Professor H. C. Cowles, head of the department of botany at the University of Chicago. Prairies are of two types. The first, usually found as interruptions in otherwise forested areas, are due to peculiar conditions of soil water, soil chemistry or other soil conditions where they occur, and are known as "edaphic" prairies. The second type are typified by the unbroken stretches of grassland in the West, and their existence is determined by general climatic conditions, regardless of local differences in the soil. The first type of prairie is not a permanent thing. The trees that surround it modify soil conditions along its border until they are able to creep over it and conquer it for the forest. "Tension line" prairies also, that occupy an intermediate position between the first and second prairie types, will in the end become forest if left to themselves. Only the last type, which lies in regions where the rainfall is too scant for permanent forest or where other general climatic conditions are unfavorable for tree growth, will remain permanently prairie.

EVOLUTION under actual field conditions, producing distinctly recognizable animal varieties in less than a man's lifetime, was described by Dr. Frank C. Baker, curator of the museum of natural history of the University of Illinois. The changes described by Dr. Baker took place in an artificial lake created by a dam in Wisconsin. Previous to its construction, the area had been occupied by a number of creeks and small rivers, in which lived several species of molluscs or shell-fish. These were of species very definitely characteristic of a running-water habitat. As their condition of life changed from river to lake, part of them became extinct, part of them betook themselves higher up the watercourses, and part stuck it out where they were. The ones that migrated upstream remained in much the same kind of environment as they had always been used to and their descendants are exactly like the ancestors of sixty years ago. The ones that held on in the old home, while it changed from river to lake, have themselves changed most markedly. In general, their outline has become relatively shorter and thicker and the shells of the snails have developed wider and looser coils. Dr. Baker points out the case as a clear-cut illustration of animals changing into new varieties under the influence of new environmental conditions.

THE time-honored motto, "In union there is strength," is appreciated even by animals so low in the evolutionary scale as worms and star-fish, according to Dr. W. C. Allee, of the University of Chicago, who spoke before the academy. Dr. Allee cited results of his own experiments, as well as the researches of other biologists, which show that aquatic animals aggregated together in clumps or masses stand a better chance against unfavorable conditions than the same animals would stand if exposed to the same conditions separately and alone. For example, one species of marine worm normally dies when it is transferred from its salty environment to ordinary tap-water. But if a large number of them, all tangled in a ball, are put into tap-water, they survive the unfavorable conditions for a considerably longer period. It is believed that the animals secrete some sort of protective material when they are massed into one of these defensive aggregates.

A SERUM partially successful in destroying trypanosomes, organisms of the group that cause the terrible African sleeping sickness, was described by Professor William H. Taliaferro, of the University of Chicago. The organism experimented upon was not the same species that causes the human disease, but is related to it. Injected into a mouse, it will cause the animal's death in five or six days. The same organism does not always kill larger animals, though it makes them sick. If a serum made from the blood of one of these larger animals after its recovery is injected into the sick mouse, the mouse does not die on time. Instead, it apparently recovers, and none of the parasites can be found in samples

of its blood. The serum, however, has not yet been developed to a point where it works a permanent cure. After a period of respite, trypanosomes which have survived the attack of the serum begin to multiply again, and this time the mouse dies. Dr. Taliaferro has found that the effectiveness of a given dose of the serum is related to the number of parasites present in the blood. In slight infections, all doses including and above the minimum dose are effective. In severe infections, no dose of immune serum has been found to be effective. In infections between these degrees, doses of the serum greater than the minimum effective dose, instead of always acting to destroy the parasites, show recurrent zones of effectiveness and non-effectiveness. For this phenomenon no wholly satisfactory explanation has yet been offered.

THE riddle of the chemical nature of tuberculin, the substance used for detecting tuberculosis in cattle, was the subject of a paper by Dr. Florence B. Seibert, of the University of Chicago. There has always been a question whether the specifically potent factor is a protein or merely an infinitesimal amount of some very highly active substance attached to the protein. The difficulty in solving problems such as this has been due to the fact that the purification of proteins is one of the most difficult of all tasks in chemistry. In Dr. Seibert's laboratory, however, efforts to obtain a purified product have succeeded in producing an active protein in crystalline form. One of the surest tests of chemical purity is obtained when crystals come out of a solution; mixed materials do not crystallize. "The crystalline protein is purer and therefore more potent than the original water soluble fraction of tuberculin from which it is made. One tenth of a milligram of the original fraction is required to produce a maximum skin reaction in tuberculous guinea pigs, whereas, of the protein obtained from it and recrystallized ten times, as little as four one hundredths of a milligram sufficed to give an equally strong reaction."

THE "quantum," the "atom" of which modern physicists suppose that light and other radiations consist, may be divided. This is indicated by experiments of Dr. A. J. Dempster, of the University of Chicago, reported to the academy. In the experiments he obtained light from a single vibrating atom, instead of many, as in the ordinary light source. But though the light is supposed to consist of single quanta, it behaved just as does ordinary light. When allowed to fall on a lightly silvered mirror, part of the light was reflected and part passed through. When this was recombined the same patterns of light and dark bands were produced as would come from ordinary light.

THE metallic part of stony meteors, which sometimes fall to the earth from the heavens, is very similar to ordinary wrought iron, made artificially, according to a report by Dr. George P. Merrill, of the U. S. National Museum.

RED stars, like Betelgeuse, the northernmost of the familiar group of Orion, which will soon appear in the east as a conspicuous feature of the winter evening skies, are probably spotted like the sun. This is the opinion of Dr. Joel Stebbins, director of the Washburn Observatory of the University of Wisconsin. In collaboration with Dr. C. M. Huffer, Dr. Stebbins has made tests of the light of different classes of stars by studying typical samples of each. The white and yellow stars, he says, appear to be fairly constant, but about a third of the red stars, including all of the biggest ones, vary in light. Some change as much as twenty per cent. in a few weeks. As an explanation of this he thinks it probable that these stars are covered with spots and that as they rotate a greater or less area of luminous surface is exposed to the earth.

THAT the heat of the earth as used in mountain building, the melting of rocks into lava and that which is radiated into space may come from the evolution or transmutation of one element into another was suggested by Dr. W. V. Howard, of the University of Illinois. Dr. Howard's studies have been concerned with the odd-numbered elements, that is, the elements that have odd numbers when arranged in the orders of their weights, beginning with hydrogen, the lightest, as number one. This number of an element is called its atomic number. Many elements consist of mixtures of what the chemist calls isotopes. The isotopes of a given element are all the same element, but their atoms have slightly different weights. Dr. Howard has worked out a series of rules by which the isotopes of elements that have not yet been successfully divided may be predicted. These relationships, together with his experimental results, lead Dr. Howard to think that the odd-numbered elements may have actually been formed from the lightest isotopes of the even-numbered elements. According to modern ideas of the structures of the atoms of matter, this could be accomplished by the loss from the first element of a proton to form an atom of hydrogen, while the atom remaining would be that of an odd-numbered element. As the process would be accompanied by the liberation of heat, Dr. Howard thinks that this is sufficient to account for much of the earth's heat.

THE WITTENBERG SYMPOSIUM ON THE FEELINGS AND THE EMOTIONS

The papers by foreign psychologists read at Wittenberg included discussions by Professor E. Claperède, of the University of Geneva; Dr. Alfred Adler, of Vienna, and Professor Henri Pieron, of the University of Paris.

Professor Claperède discussed the theory of emotion advanced by William James some forty years ago to the effect that we do not run away because we are afraid, but that we are afraid because we run, that it is the process of getting ready to run that warns us that we are in danger. The feeling of danger is useful because it urges the man to seek safety. If he can run fast enough, he proceeds to escape without any emotion at all. But if he lacks faith in his legs, his body is thrown into a state

of excitement as he tries to run and he is made conscious that he is gripped by fear. "Feelings are useful in our conduct, while the emotions serve no purpose," Professor Claperède concludes. "The uselessness, or even the nuisance, of the emotion is known to every one. Here is an individual who would cross the street. If he is afraid of automobiles, he loses his composure and is run over. Sorrow, joy, anger, by enfeebling attention or judgment, often make us commit regrettable acts. In brief, the individual in the grip of an emotion loses his head."

DR. ADLER, speaking on superiority and inferiority, pointed out that from the time of the child's first social contacts with his mother, his aim through life is to overcome difficulties of life and to gain superiority. The mother must try to give the little child freedom to develop his superiority through independence, self-confidence and courage. Later, she must spread the interest of the child to other persons and situations, so that he feels at home in the world. Three types of young children have difficulty in attaining the goal of normal superiority toward which every human being strives: First, children with imperfect organs; they need more time and more effort than others to integrate. Second, spoiled children. They are not free to function alone and develop in the direction of always wishing to be supported. They are attacked on all sides because of this behavior and feel in a hostile environment and therefore under strain. Third, hated children—illegitimate, not wanted, ugly, crippled. They have the same difficulties as the second type, but without the aid of a supporting person. Useless, anti-social activities of problem children, neurotics, criminals, suicides, sexual perverts and prostitutes are caused by a lack in social feeling, courage and self-confidence.

AN example of how emotions bring about intense unusual activity in animals was given by Professor Pieron. A crab fettered by one claw and left with food just out of reach will resignedly starve to death. But put a polyp, the crab's most deadly enemy, nearby, and the prisoner crab will be convulsed with fear. Excitement racing through its nerves will send a violent shock to the tied claw and the claw will come off, so that the crab can scuttle off to safety. From the amoeba, one of the simplest, tiniest forms of animal life, up to man, action is always guided by feelings. Even purely mental action in man, which we call thought, is regulated by his state of feeling. If the feelings become sufficiently intense so that there is an abnormal discharge of nervous energy, the emotional stage is reached. In emergencies, this nervous energy gives the animal or man greater power to fight or flee. But the after-effect is nervous exhaustion and temporary disorganization of the body machinery. In a man, if he is highly emotional and if he is not well balanced, the emergency reserve of energy may be a source of real danger, "like large ponds, established along a watercourse, which accumulates the available energy and may cause disastrous inundations if the barriers give way before a sudden onslaught. In the animal world as among men, emotions sometimes lead to useless outbursts of activity. An ant, coming upon a spot of soil near its nest which has been saturated with the odor of foreign ants, sometimes begins to strike the ground violently with its mandibles, instead of being content to flee or to explore carefully the neighborhood of the suspicious place."

ITEMS

A PAPER giving the results of a series of lighting experiments made by C. E. Ferree and Gertrude Rand, of Bryn Mawr College, was read before the joint session of the annual conventions of the National Committee for the Prevention of Blindness and the Illuminating Engineering Society. A number of factory workers were tested for the quickness with which they could see details in terms of black and white. It was found that whether the object is white against a black background, or *vice versa*, there is a rapid increase of speed as the amount of light is increased, up to 15 or 20-foot candles. While there is no way of measuring a man's eye-strain, the tests prove that eye-strain may be lessened greatly by increasing the light to the point where the eye will work at its optimum speed.

RABIES is one of the most important of the country's health problems in the estimation of Dr. Thurman B. Rice, of the Indiana University School of Medicine. Speaking at the American Public Health Association, Dr. Rice stated that rabies is increasing and, while the number of deaths is not large, the suffering and fear it causes are so great that they make it the most dreaded of all diseases. There is very little rabies in northern states and in Canada, but in the southern states and in the middle west the disease is on the increase. A survey of conditions in European and South American countries shows that in sections where dog quarantines and muzzling ordinances are prevalent and strictly enforced rabies can be stamped out.

DR. KARL EDEN has just completed a statistical study in Stockholm that shows that the birth rate of the laboring classes is about 35 per cent. below that of the more affluent strata of society. Stockholm laborers are apparently willing to let their earnings determine the number of their progeny, a state of affairs in marked contrast to that which obtains in almost every country in which statistical surveys have been made. The so-called upper classes are usually the ones that limit the size of their families.

CANE CREAM, a new sugar by-product developed by the Bureau of Chemistry, has proved to be such a popular delicacy in the South that the government is now introducing it to northern cookery experts. A deep brown in color, the new offering is more or less of a medium in flavor between the Canadian maple cream, a thick spread made from maple-sugar, and the molasses syrup popular for use on pancakes. Experts claim the flavor retains to an unusual degree the taste of the original sugar juice. Whereas molasses is the juice remaining after the making of sugar by crystallization of the cane sap, cane cream is the whole juice—thick, creamy and syrupy.