National Academy Discusses Plants, Stars, Evolution

Following are reported some of the interesting papers presented at the Urbana, Ill., meeting of the National Academy of Sciences, October 18 to 20.

Leaves Reflect Light

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 before the meeting of the National Academy of Sciences by Prof. Charles A. Shull of the University of Chicago.

Different leaves reflected different proportions of the light that fell upon them, Prof. Shull found, 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 underside.

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.

Cells Build Into Animals

The medieval wonder tale of St. Nicholas putting together and bringing to life three children who had been chopped to bits by savage pagans has been realized, somewhat farther down in the scale of organisms, by Dr. Charles M. Child of the University of Chicago. He told how he did the trick with one of the lower marine animals at the Scripps Institution at La Jolla, Calif.

The animal belongs to a genus known as Corymorpha, whose nearest familiar relatives are the sponges; though it is quite small and externally at least looks very little like a sponge. Dr. Child ground a number of these up in a mortar with sand, until they were reduced to a formless pulp. Then he strained their remains through a piece of fine bolting silk, 150 meshes to the inch. What came through consisted of cells, still alive but separated from all their former connections or at most bunched in very small groups. A higher animal in this state would be simply hopelessly dead.

Not so the Corymorpha cells, however. They proceeded to get in touch with their neighbors, and wherever cell touched cell they stuck together, forming masses which rounded up into spheres. If the sphere were more than a twelfth of an inch in diameter it died; apparently size and efficiency are not concomitant in this part of the animal world. The smaller spheres not only lived but gradually developed into complete and healthy animals, even though they were assembled out of bits of a dozen or more originally separate individuals.

Prairies Becoming Forests?

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 answered by Prof. H. C. Cowles, head of the department of botany at the University of Chicago.

Prairies are of two types, Prof. Cowles stated. 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, Prof. Cowles believes, 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.

Tuberculin is Protein

The riddle of the chemical nature of tuberculin, the substance used for detecting tuberculosis in cattle, is a step nearer solution through researches reported by Dr. Florence B. Seibert of the University of Chicago.

There has always been a question, Dr. Seibert stated, 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 her 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," Dr. Seibert said. "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."

Sixty Years Show Evolution

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

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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 water courses, 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 today 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.

Serum for Sleeping Sickness

A serum partially successful in destroying trypanosomes, organisms of the group that cause the terrible African sleeping sickness, was described by Prof. William H. Taliafero 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, trypanosmes which have survived the attack of the serum begin to multiply again, and this time the mouse dies.

Dr. Taliafero 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.

Spots on Stars?

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 are covered with spots, and that as they rotate, a greater or less area of luminous surface is exposed to the earth.

"Atoms" of Light Divided

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.

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 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.

Earth's Heat from Elements

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. This is the suggestion of 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.

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To fight skyscraper fires, the New York Fire Department has a $14,500 engine which can pump a stream of water to the height of the Woolworth Building.

Fiber from the kapok tree of the tropics is said to be 20 per cent. more buoyant than cork and is gaining importance as a filler for life preservers.

A Swedish company is to assist the Soviet government to build a lime-nitrogen factory at Nijni Novgorod, with an initial capacity of 30,000 tons a year.