Latest Knowledge of Plants Reported

Botany

Leading Botanists at World Congress in Cambridge

Americans Given Important Positions as Section Heads and Vice-Presidents—Last Congress Held at Cornell Four Years Ago

BACTERIA that find oxygen, the very breath of life to most organisms, to be a rank poison and that breathe hydrogen instead, have had their physiological secrets investigated by Prof. J. W. McLeod of the University of Leeds school of medicine.

Plants and animals take up oxygen simply as the readiest means of obtaining energy from food substances. These bacteria, which prefer places where there is little or no air, are able to get their needed energy by a different process. They detach hydogen from certain complex organic compounds, and the breaking apart of these molecules releases energy.

Oxygen is inimical to this process. If the newly released hydrogen comes into contact with oxygen the two elements unite to form hydrogen peroxide. Bacteria that can live in the presence of a very little air can tolerate a certain low concentration of hydrogen peroxide, but those that demand surroundings where there is no oxygen at all apparently find themselves paralyzed if hydrogen peroxide is generated even in small quantities.

A curious fact about these oxygen-hating bacteria is that they are quite lacking in one of the enzymes or organic ferments, catalase. This particular enzyme was once thought to be absolutely indispensable to any kind of life.

Missing Plant Links

"Missing links" plague students of plant evolution no less than they do those who concern themselves with the history of animals or of man. At the Botanical Congress, Prof. A. C. Seward of Cambridge University told of the difficulties of scientists in bridging the gap between the plant forms of the late Paleozoic, when the principal coal beds were formed, and those of the Mesozoic, or age of dinosaurs.

World climate, and the face of the earth itself, underwent revolutionary changes during that critical period in geological history, according to Prof. Seward, and the great changes in environmental conditions were reflected in the downfall of the earlier dynasties that had ruled the ancient forests and the rise of new and different dominating families. And the hereditary steps by which the new arose from the old cannot be traced in any fossil records which have yet been discovered.

Prof. Seward believes that the rocks of inner Asia, which have recently given up many of the early family secrets of the dinosaurs, may also yield some of the missing chapters in the story of plant evolution, once they are searched with sufficient care and understanding.

Tell-Tale Pollen

Stories of mighty hunters of old, who could shoot a deer when they could see nothing but its shadow, are matched in modern botanical science by men who can tell when and where there was a forest a hundred thousand years ago by searching for microscopic grains of fossil pollen in the peat of an ancient bog. The yellow fertilizing dust that settled on the waters and was drowned and absorbed into the muck on the bottom is read especially zealously to learn the movements of the great thickets of hazel that marched on the margins of the sub-arctic forests in the days when the glaciers were retreating from the face of Europe.

But it is not all plain sailing, this seeing of woods where only the fossil dust of its flowers remains. Dr. G. Erdtman of the University of Alberta told of some of the difficulties encountered in searching for vanished woods with a microscope.

It cannot be assumed, he says, that where there is much pollen there was a heavy growth of the plants that produced it, and that where there is none there were few or no such plants. If the bog into which the pollen fell was not in proper condition to receive and preserve it, the pollen would be lost and thus no record would remain. Such conditions would include a chemical or bacterial state of the water that would cause the pollen grains to decay, a frozen surface over the bog at the time of pollen-shedding, or one of a number of other circumstances. Therefore one's grain of pollen must sometimes be taken with a grain of salt.

Taking a Plant Census

Plant populations, not less than human populations, present problems for census enumerators. Whoever would understand the state of affairs in a plant community—say a forest, an area of grazing land, or a swamp—finds it necessary to adopt some methods that are like those of the census enumerator, and to follow others that are very different. Prof. E. J. Salisbury, one of England's best-known students of plant sociology, outlined the principles and practices of his science as he and other specialists in this field have worked them out.

Plant sociologists and ecologists often speak of the "physiognomy" of plant society. By this they mean just about what the word actually implies: what the vegetation looks like. The brushy growth in such different parts of the world as Arizona, South Africa and interior Australia is made up of quite different species of plants, yet the general appearance of the whole vegetation is similar for all three regions: tough, hardy bushes with small, harsh, drought-resistant leaves, interspersed with water-storing succulent plants like century-plants and aloes that look alike even though they are only remote cousins.

Another point of approach for the plant census taker is known as "Floristics." This consists of counting and naming the plants themselves, and in learning which ones are always

AMERICAN leaders in the study of plant life were accorded prominent places in the councils of the Fifth International Botanical Congress, which met in Cambridge, England, during the past week.

The presidency of the meeting was naturally given to the great university which is acting as host to the world botanists, in the person of Prof. A. C. Seward. The active work of the sessions was carried on in eight sections, and three of the eight section chairmanships were held by American scientists.

These were Prof. H. C. Cowles of the University of Chicago, section on plant geography and ecology; Prof. R. E. Buchanan of Iowa State College at Ames, bacteriology; and Prof. L. R. Jones of the University of Wisconsin, plant diseases and the fungi that cause them. There were also three Americans among the honorary vice-presidents: Prof. L. H. Bailey of Cornell University, Prof. R. A. Harper of Columbia University, and Dr. E. D. Merrill of the New York Botanical Garden.

Many American botanists attended this meeting, the first international gathering of its kind since the International Congress of Plant Sciences held at Cornell University, Ithaca, N. Y., four years ago. The Ithaca congress was the first international botanical meeting of the post-war period.

BACTERIA that breathe hydrogen and are poisoned by oxygen; how pollen which fell archaeological ages ago are helping scientists reconstruct "lost forests"; how leaves in the sun differ from those in the shade; the search for "missing link" plants—these are some of the subjects discussed by the botanists and reported in this issue. Another article on the Congress will be published in the Science News-Letter next week.

found together and which keep away from each other. Thus beech, maple and hemlock were constant companions in the old hardwood forest of Michigan, but oaks were not often found with them and willows never.

Stage by Stage

Another is the way in which one plant population yields place to another, just as a group of Sicilian immigrants may move out of a given part of a city before an oncoming wave of Mexicans or Negroes. This type of study is called "succession."

Successional series of plant communities may be traced by anybody around a pond that is slowly filling up. Out where the water is still deep there will be a zone of water-lilies. Closer inshore, arrow-leaf occupies the shallower margin. The marshy shore will support a population of cattails, sedges and rushes. Then will come a belt of button-bush, or willows, or alders. On slightly drier land will be soft maples, elms and box-elders. And finally is a permanent "climax" population of oaks and hickories, or perhaps maples and beeches. Each stage pushes the preceding one out as the land becomes fit to occupy, making the process a literal succession.

Treetops in a Desert

Every treetop lives in a desert, exposed to hot sun and drying wind; it is, moreover, farthest removed from the base of water supplies. It responds to these desert conditions by becoming more or less like a desert plant, Prof. Bruno Huber of the University of Freiburg has discovered.

An examination of leaves and stems from the tops of trees showed anatomical differences according to their location in sun or shade. "Shade leaves" were more like those on the parts of the tree closer to the ground and better sheltered from evaporation; "sun leaves" were protected in various ways from the drying effects of the air.

Sometimes they worked to keep down the rate of evaporation by means of thicker skins, smaller cells, tinier breathing-pores or stomata, etc., and sometimes they yielded to the air's demand for water but had better facilities for renewing the supply from beneath. Prof. Huber calls attention to the fact that plants of both types can sometimes be found growing side by side in places where the evaporation rate is high.

Another Evolution Theory

Evolution through crossing of dissimilar parents, a rival theory to the continuous-variation idea of Darwin and the sudden-mutation mode advocated by DeVries, is upheld by a noted Dutch botanist, Dr. J. P. Lotsy, who spoke before the Congress.

Dr. Lotsy points out that our idea of a species is based on the assumption that all individuals that look very much alike have had a common descent. We see the grandchildren and take the ancestors for granted. Beginning at the other end, he selects ancestor-plants and traces the development of new character-combinations in their descendants. In spite of the plausibility of the mutation theory, he insists, it has never been proved that a new form of specific rank has arisen in this manner. The only new forms whose origin has been actually observed, he says, have been produced by hybridization, though even these are not of specific rank.

Dr. Lotsy regards it as quite possible that the main divisions of the organic kingdom originated by hybridization. In many of the lower forms of life, from which the higher ones are assumed to be derived, the cell protoplasm as well as the nuclei unite during the reproductive process. This, Dr. Lotsy states, furnishes a possible mechanism for the development of the major differences that separate the great divisions of the plant and animal kingdoms.

How to See Cells

How living plant cells can be induced to absorb dyestuffs making their usually invisible workings possible of examination with the microscope, was discussed by Prof. Hans Pfeiffer of Bremen, Germany. Pror. Pfeiffer reviewed the work of a number of his colleagues as well as his own most recent researches, and discussed the difficulties sometimes encountered in getting living protoplasm to take up coloring matter rapidly enough, or evenly enough, or without damage to itself.