SCIENCE NEWS

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THE INTERNATIONAL CONGRESS OF PLANT SCIENCES

By Dr. Frank Thone

Man's conquest of the plant kingdom has only begun. The number of plants that have so far bowed their heads to man's dominion is as yet insignificant. In the extension of his knowledge of plants and of his ability to use them for his own benefit lies one of the great glories and hopes of the human race.

With this vision of opportunity Dr. Liberty Hyde Bailey, chairman of the International Congress of Plant Sciences, now in session at Ithaca, welcomed his fellow botanists from all over the world.

"There are," he said, "about 500,000 species of known and named higher plants. Of these only 10 per cent. are cultivated, and out of this small fraction most species are cultivated only in an incidental way. Fewer than 100 species supply us with food, fiber and timber, the three great staples of our daily life.

We have no reason to believe that the species now cultivated are intrinsically the most useful of those that exist. Some neglected weed, in the hands of a skilled botanist, may some day overturn all our agriculture. We have learned much about plants; yet know very little as compared with our ignorance about them.

Chopping down thousands of trees as a means to conservation was the apparently paradoxical idea championed by Professor J. W. Toumey, of the Yale School of Forestry. He explained that in many large forest tracts there are great growths of thrifty young pines half smothered under a heavy canopy of soft maples, birches and other trees of relatively low value. To give these young trees a place in the sun he advocates what is called "liberation cutting," removing the old trees.

In his discussion before the foresters, Professor Toumey explained why young trees from wet habitate will not thrive if started from seed on the dry hills. Natural upland trees, like the hickories, many kinds of oaks and most evergreens, drive a long tap root into the soil as soon as they sprout; they may have a "shoestring" root over two feet long when they are one year old, and their tops only six inches high.

Natural lowland trees, like willow and black gum, run their first roots as shallow laterals, close to the surface. Hence drought kills them, while the deeper rooted hill species can draw upon water supplies at lower levels. Before we start cultivated forest, Professor Toumey warned, we must watch the root habits of our trees. "As the root's inclined, so the tree will grow."

Native American fruits for American tables is one plank in the platform of Professor N. E. Hansen, of South Dakota, who has nevertheless made six trips into northern Eurasia searching for hardy fruit trees for our cold Northwest. He explained that for many things that are not native, like pears and peaches, we must naturally look to other lands, but he believes in using native species where possible.

He told of one of his recent horticultural creations, the Minoka apple, which bears fruit the first season it is set out as a one-year old whip. Professor Hansen hopes that a great national arboreteum of fruit trees may soon be endowed. He points out that many desirable stocks, although not of present value commercially, are needed for breeding and other scientific purposes and believes such an arboreteum would be the best place to preserve and use them.

In a paper by Dr. A. Ursprung, of the University of Freiburg, Switerland, the tremendous power exerted by plants in getting water from their root tips to their topmost leaves was vividly presented. Dr. Ursprung's researches have revealed the tiny cells of which plants are composed as the most powerful suction pumps in the world. Their action, however, is not pulsating or heartlike, but steady and even, and is due to the suction power of the sugar and other substances contained in the cells.

This power reaches the equivalent of over 500 pounds a square inch in some petals and leaves. More remarkable still, the power sometimes differs by as much as sixty or seventy-five pounds a square inch between opposite sides of the same cell, though they are literally only a hair's breadth apart.

At the opening session, after a brief word of welcome from Dr. Livingston Farrand, president of Cornell University, an invitation to make London the meeting place of the congress in 1930 was presented by A. B. Rendle, of the British Museum. England was to have been the scene of the present meeting, but the British botanists waived their right in favor of their American colleagues.

EVOLUTION OF FOREST DEVELOPMENT

Not only does each kind of tree and bush and flower in a forest have its evolutionary ancestry, but the whole forest is the product of changes from one kind of vegetational society to another through many generations, and is thus itself the outcome of an evolution.

Professor H. C. Cowles, head of the botany department of the University of Chicago, explained before the congress the latest developments in his doctrine of the evolution of plant societies, or "succession" as it is more usually called. He used for his text the changes that have taken place in the swamps and forests of the great dunes region along the shores of Lake Michigan in Indiana and Michigan, a region which he has studied for many years.

The evolution of plant society, Professor Cowles said, began here as with a clean-wiped slate when the frozen

land was left bare by the retreat of the great continental glaciers a hundred thousand years or so ago. The first plants that came in on the heels of the retreating ice were the scrubby willows, birches and other tundra growths now commonly found in Alaska and northern Canada. These were followed by sub-Arctic species of slightly more vigorous habits, and these again by a gradually developing forest reaching its full climax with a rich covering of beech, maple and hemlock on the Michigan dunes. As each step in the evolutionary process gave way to its successor, the plants that marked it did not wholly disappear, but remnants of their number linger still in out-of-the-way corners from which the more luxuriant newcomers have not yet been able to dislodge them. It thus happens that these dunes or any similar regions will constitute a sort of living museum of their own botanical history.

They even contain what may be prophecies of their future, Professor Cowles added, for here on the drier parts of the dunes are found advance guards of desert vegetation: tough grasses and herbs reminiscent of the plains of Kansas, together with at least one sagebrush species and one kind of prickly pear cactus. If, as some students of the subject predict, the earth is now passing into a dry-climate period, the evolutionary calendar of the forest succession is the first to tell of it.

FORESTS AS FACTORS IN RAINFALL

Forests play raindrop tennis with the clouds, picking up the water that falls upon the ground and tossing it back into the air. They are therefore important factors in the distribution of rainfall over a continent. These were the salient points of the address by Raphael Zon, director of the Lake States Forest Experiment Station of the U. S. Forest Service.

Mr. Zon challenged the current idea that the oceans contribute most heavily to the rainclouds that water the land, stating that only two ninths of the moisture they carry is derived directly from saltwater bodies. The rest, he said, is returned from the soil that has received it to the air, whence it falls again as rain or snow. And forests, he said, send into the air far more water than do grassy plains or areas of bare soil.

"The reasons for the tremendous consumption of water by forests are clear," Mr. Zon stated. "To produce one pound of dry wood substance from 500 to 1,000 pounds of water must pass through the body of the tree. A forest, if it is fairly stocked with trees, produces at least 100 cubic feet of wood per acre per year, including root and branch wood. A cubic foot of coniferous wood weighs on an average 25 pounds, that of hardwoods about 40 pounds. An acre of forest, therefore, produces on an average from 2,500 to 4,000 pounds. To produce this amount of wood from two and one half to four million pounds of water will have to pass through the tree and be given off into the air. If this water were distributed over an acre of land, it would cover it to a height of twelve inches.

"Forests, therefore, lying in the path of prevailing winds blowing from oceans to continents, enrich the air passing over them with vapor and help in carrying this moisture farther into the interior of the continent. We have in the United States a clear example of this influence in the forests of the Coastal Plain and the Southern Appalachian Mountains. The prevailing southerly winds of the summer, upon reaching the shores of our southern states, are drained of the vapor derived from the Gulf of Mexico. In further movement north, they would, therefore, become dry winds, if not for the presence of forests over which they pass. Passing over large stretches of forest, they become alternately enriched with vapor and drained of moisture, and in such relays the moisture is carried into our central and prairie region, making summer the period of greatest rainfall there."

INTERNATIONAL PLANT SOCIETIES

A League of Nations among the plants, that originated before the last Ice Age a hundred thousand years ago and has been standing ever since, was the subject of Professor M. L. Fernald, of Harvard University. In addition to the many strictly native plants in America, Professor Fernald pointed out, we have botanical alliances with Asia, with Europe and along our seashores we cultivate the Pan-American relations.

There are many plants in the eastern part of the United States and Canada that resemble those of Europe, and were once thought to be identical with them, though later experience has shown that they are distinct. In addition to these, however, there are numbers of others that are exactly identical with the European species, especially those found in the region of the Gulf of St. Lawrence and in Newfoundland.

"In studying the floras of regions like western Newfoundland or the Gaspé Peninsula," he said, "it is necessary to check carefully the flora of Arctic Lapland and adjacent Arctic areas of Europe. Another region which shows striking similarities, if not absolute identities with portions of Europe, is the area centering on the Gulf of St. Lawrence and including southern and southeastern Newfoundland. Here occur many species unknown elsewhere in North America but characteristic of Atlantic Eurasia. Related geographically to this group are the species typical of eastern North America, but found in Europe only in the extreme northwest and especially from western Ireland to the Baltic region.

"The last element in the flora of temperate eastern North America is the coastal plain flora made up almost exclusively of genera of families which are unrepresented in the European flora, but which have a wide dispersal in the southern hemisphere.

FORESTS OF THE ICE AGE

A book of the forests of the ice age, whose leaves were the leaves of the trees themselves, preserved a hundred thousand years or more in thick deposits of peat was the subject of a paper by Professor Wladyslaw Szafer, of Cracow, Poland.

The Ice Age was not one long continuous freeze, Professor Szafer reminded his hearers, but came as a kind

of series of millenium-long cold waves, with equally lengthy warm periods in between, when the empty lands of the North filled up with grass and flowers and trees, only to lose them again with the next advance of the ice.

The recently discovered deposits of plant remains in Poland indicate that between the third and fourth glacial "waves" there were rich forests in Poland. Compared with similar deposits already known from Germany and the Scandinavian countries, they indicate that Poland then had a climate warmer, but also drier, than that of the coastal regions.

A dramatic story is unfolded by the records in successive layers in the deposit. The first sign of returning life after the retreat of the ice is shown by remnants of Arctic plants—shrubby birches and willows, like those of modern mountain tops and tundras. Above these is a sub-Arctic phase, with several kinds of pine and a species of larch. Then comes a mixed phase of pine and oak. Finally the broad-leaved forests of temperate lands are in evidence: first a layer of hornbeam mingled with fir and yew, and then beeches, maples, ironwood and other trees of a climate like our own. This represents the highest development reached in the "recess" between glacial advances.

After the climax was reached, the record shows, a recession in the trees began as the climate once more turned cold and the return of the ice was on. The climax forest was succeeded by a second fir and yew growth, and this by the pine and oak and then the pure pine stage, until finally nothing was left but the meager tundra growth of birch and willow bushes fighting against the slowly conquering ice.

ITEMS

A NEW link binding plants and animals together in a single web of living beings was the subject of Dr. Kathleen B. Blackburn, of Armstrong College, England, in an address before the section on cell study of the International Congress of Plant Sciences. Dr. Blackburn has discovered that plants as well as animals have in their cells the special bits of living matter known as the sex chromosomes. Until her discovery only animals were known to possess this detail of their organization, but now she has demonstrated its presence in the cells of a number of plants which bear their male and female flowers upon separate individuals.

THE old picture of a systematic botanist, determining likenesses and differences among plants by counting petals, examining stamens, and so on, must now be modified to include a high-power microscope, according to Professor Otto Heilborn of Stockholm. Plants that differ in species differ also in the numbers of their chromosomes, the exceedingly tiny bits of living substances within the cell that turn especially dark when a plant section is prepared for the microscope. Examination of these minute details, Professor Heilborn told his hearers, frequently settles vexed questions of identity, especially in the cases of important economic plants whose ancestry has in many instances become much mixed and hard to determine.

PLANTS that grow in the water have their own soil preferences quite as marked as those of plants that grow on the land, though because we rarely see the bottom of a lake or pond we seldom think of this matter, according to Dr. W. H. Pearsall, of the University of Leeds, England. He has been investigating the water vegetation of English ponds, and finds apparently similar ponds with differing populations of water lilies, cattails, reeds, etc., have perfectly valid reasons for these differences, for under the surface there are considerable variations in the depth to which the bottoms are silted, in the fineness of the bottom soil, and even in the chemical nature of the water.

WHEN saplings stand very thickly in an area of new forest growth, it is profitable to thin them out very drastically, Dr. Sven Petrini, Swedish forest expert, told his colleagues at the International Congress of Plant Science. The amount of wood added to the total growth year by year is about the same per acre, within certain limits, he said, whether it is grown on many trees or on relatively few; but it is more profitable to make large additions to a few trees than to make small additions to many. For this reason radical thinning has become his practice, the young trees being used for small timber and in the production of charcoal, pulp and other forest products where size does not count.

HOW the climate and geography of Switzerland have influenced Swiss modes of life and helped to make Swiss history by controlling the areas of meadow and forest in the mountain republic was outlined by Dr. Eduard Ruebel. Dr. Reubel is one of the foremost figures in the world in the field of ecology, or the study of plants in relation to their environment. The speaker presented two elaborate maps showing in detail the distribution of the regions of forest, meadow and farm in Switzerland in their relation to climate and its changes, and showed how the population was distributed in relation to the plant life and how the industries of any given community were moulded by the character of the vegetation of the slopes or plateaus or valleys.

THE rejuvenation of Italy is to be pased by a rejuvenation of Italian forests, according to two prominent Italian forest scientists, A. Serpieri and A. Pavari. They told of the far-reaching conservation and reforestation program of their government and outlined the principles on which it is to be worked out. Scattered all over Italy, they said, there are already over 150 forest experiment stations, with adequate funds and personnel, carrying on their researches under the general direction of the Royal Institute of Agriculture and Forestry at Florence. At the latter institution there are complete laboratories for investigation in forest botany, plant distribution, chemistry, geology, forest soil study, forest biology and pathology, and silviculture, together with facilities for the study of forest management, economics and legislation.