

Voted that the next meeting be held on December 14, instead of December 21, the date specified by the constitution.

The following persons on motion of the nominating committee were elected officers:

*President*—Chancellor Henry M. McCracken, D.D., LL.D.

*Vice-Presidents*—Dr. John H. Denbigh, A. T. Schaufler, William T. Hornaday.

*Secretary*—Rev. F. Barrows Makepeace.

*Treasurer*—Olin J. Stephens.

*The Council*—Dr. N. L. Britton, *Chairman*; Victor H. Paltsits, Rev. Henry M. Brown, Arthur A. Stoughton, Walter E. Hallett, Albert E. Davis, G. Gordon Copp.

#### LECTURE.

“The Hemlock Grove on the Banks of the Bronx River, and what it signifies; with a review of the History and Literature of the Hemlock Tree.” Illustrated by lantern slides, by Dr. N. L. Britton.

#### THE HEMLOCK GROVE ON THE BANKS OF THE BRONX RIVER AND WHAT IT SIGNIFIES.

The forest of Canadian hemlock spruce along the Bronx River, within the portion of Bronx Park set apart for the New York Botanical Garden, is one of the most noteworthy natural features of the Borough of the Bronx, and has been characterized by a distinguished citizen as “the most precious natural possession of the city of New York.” I shall attempt to describe it in some detail and to indicate the relationship of this hemlock spruce, commonly known in America as hemlock, to other evergreen trees; to indicate its natural geographical distribution, trace its history, and discuss its uses.

This forest exists in the northern part of Bronx Park on the banks of the river and their contiguous hills; its greater area is on the western side of the stream, but it occupies a considerable space on the eastern side above the Lorillard Mansion and below the “Blue” bridge. The area west of the river extends from just above the “Blue” bridge down stream to a point nearly opposite the old Lorillard Snuff Mill, and is the part commonly designated “Hemlock Grove.” Its total length along the river is approximately 3,000 feet; its greatest width, 900 feet, is at a point on the river about 700 feet above the water fall at the

Lorillard Mansion. The total area occupied by the trees on both sides of the river is between thirty-five and forty acres.

While this area is mostly covered by the hemlock spruces, and although they form its predominant vegetation, other trees are by no means lacking; beech, chestnut, sweet birch, red maple, hickory, oaks, dogwood, tulip-tree, and other trees occur, and their foliage protects the hemlocks from the sun in summer to a very considerable extent; there are no coniferous trees other than the hemlocks, however, within the forest proper. The shade is too dense for the existence of much low vegetation, and this is also unable to grow at all vigorously in the soil formed largely of the decaying resinous hemlock leaves; it is only in open places left by the occasional uprooting of a tree or trees by gales that we see any considerable number of shrubs or herbaceous plants, their seeds brought into the forest by wind or by birds. In fact, the floor of the forest is characteristically devoid of vegetation, a feature shown by other forests of hemlock situated further north. The contrast in passing from the hemlock woods to the contiguous hardwood area which borders them to the west and north, toward the museum building and the herbaceous grounds, is at once apparent, for here we see a luxuriant growth of shrubs and of herbs, including many of our most interesting wild flowers.

The seeds of many kinds of plants growing outside the hemlock forest are yearly transported into it by the wind and by birds, but, as I have said, grow very sparingly; the seeds of the hemlock itself do little if at all better; they cannot germinate immediately under the trees which bear them, but spaces exposed to the light are soon occupied by seedling hemlocks, and it is in this way that the forest is perpetuated; young trees may be seen in considerable numbers in places open to the sky along the old paths and trails and along the margins of the forest.

The soil of this forest is in most places thin, often a mere shallow layer immediately upon the gneissic and schistose rocks which underlie it, composed of the decaying particles of the rocks and of the rotted products of countless annual leaf-falls; the roots of the trees accommodate themselves to this condition, lengthening in all directions in their search for food, and often assuming unusual and sometimes grotesque forms in penetrating crevices, or exposed where the rain has washed the soil away. A capital illustration of this was to be seen several years ago when a giant tree was uprooted during a violent storm; it had scarcely any soil under it, coming away and leaving the rock bare over several square yards, but its roots reached many feet all around and it

had been anchored by some of them penetrating cracks in the rock; otherwise little energy would have been needed to fell it. This soil, composed so largely of natural leaf-mould, is annually enriched in the autumn by the leaf-fall from oaks, chestnut, birch, and the other deciduous trees, and again in the spring by the leaves of the hemlock itself, which persist over winter and do not fall away to any extent before the new growing season commences; this is nature's method of replenishing forest soils, and any interference with it jeopardizes the food supply of the trees and consequently endangers their health and vigor; they thus obtain naturally much of their food from their own products of previous years, and therefore it is not good practice to rake up leaves within the forest.

And, if I may be permitted to digress, all natural woodlands should be treated in accordance with this policy of let alone. Artificial plantations in parks and on lawns cannot always be so maintained, from practical considerations, but the food removed by raking off fallen leaves should be replaced at intervals by means of fertilizers of one kind or another, giving back to the soil those chemical substances which the trees and shrubs are annually taking from it, otherwise the soil will be impoverished. The vigorous growth of trees is quite parallel with that of any other crop raised on the soil, and no intelligent farmer would permit his farm to go long without manure.

A large part of the Bronx hemlock forest may safely be regarded as primeval, and this consideration is one of the most interesting facts connected with it, because tracts of virgin woodland are few and far between in the vicinity of New York. Doubtless individual trees were cut from it in former times, but never sufficient to prevent its continuance. The Lorillards, who held this land for many years before it was taken for park purposes by the city, carefully protected the woodland, and the thanks of the present and of future generations are due them for its preservation; it was evident to the commission in charge of selecting areas for the great park system of the Bronx that this preservation should be continued, and their action in securing this land for public enjoyment and instruction was timely, for its increase in value, due to the northward growth of the city, became an incentive to the proprietors to realize its monetary value, and it was, indeed, at one time surveyed and laid out for streets and building lots, as is evidenced by the numerous granite monuments sunk in the ground; a greater misfortune to the city than the carrying out of this proposition can scarcely be imagined, and it

is a great satisfaction to know that it was averted. The only dangers to which the forest can now be exposed are vandalism or the thoughtless starting of fires, and these it is earnestly sought to prevent by frequent patrolling, but the number of people in the community bent on mischief would be a surprise to you all if it could be accurately estimated. To further ensure the safety of the forest, it will doubtless be necessary to adopt measures looking toward the restriction of travel through it to well defined lines, by indicating the existing paths and trails; the thin soil and the consequent proximity of the tree roots to the surface cause indiscriminate tramping over them by multitudes to be undesirable. The parks and gardens of the Bronx are already visited by considerable numbers of people, but when these numbers are very largely increased, as they certainly will be, the policing problem, already acute, will become far more serious.

The hemlock spruce is one of the most beautiful of American evergreen trees, the delicate graceful spread or slight droop of its twigs being quite characteristic of it as compared with its relatives the firs and true spruces, and the density of its shade is unexcelled. The trunk rises as a noble column, sometimes attaining a height of 110 feet with a diameter just above the base of four feet; growing undisturbed and not crowded by other trees, its lower branches clothe the trunk quite to the ground, but such magnificent specimens are seldom seen, because it is typically a tree of groves and forests, and one half or two thirds of the trunk is usually bare of branches; the reddish bark, sometimes tinged with purple, becomes three fourths of an inch thick, that of old trees ridged and furrowed; the inner layers of the bark are astringent, and it is used in large amounts for tanning leather, sometimes mixed with oak bark; it is the most important economic product of the plant, many thousands of trees being annually felled in the northern states and Canada for this purpose; a fluid extract of the bark is used in pharmacy as an astringent. The wood is light in weight, its specific gravity when entirely dry being only 0.42, a cubic foot of it weighing but twenty-six pounds; it is light brown or nearly white in color, soft, weak, coarse-grained, and not very durable. It furnishes a coarse and cheap lumber largely used as boards in building houses and other structures, and for some other special purposes; it contains a resin known as Canada pitch, obtained by boiling the wood and bark especially taken from the round knots, which was formerly used in pharmacy as the basis of plasters, but it is not now utilized to any considerable extent. The leaves are small and narrow, averaging a little more than half an

inch in length and rather less than one-twelfth-inch in width; they are dark green on the upper side, but quite pale green or whitish on the lower surface; they spread like the barbs of a feather in one plane; the new ones appear on the twigs in the spring and are then bright green, the tips of the twigs nodding; they persist on the twigs through parts of three seasons, falling away in the spring; like other "evergreen" trees, the hemlock spruce is evergreen because it is never bare of leaves, not the same leaves, however. The flowers, as in all cone-bearing trees, are small, of two kinds, and borne in small, dense clusters, appearing in April or May; the clusters of staminate flowers, those containing the pollen grains, are found in the axils of the leaves, the clusters of pistillate flowers are at the ends of the twigs, and after their fertilization by the pollen from the staminate flowers, ripen into the cones; these are oblong, nodding, blunt, a little longer than the leaves, composed of numerous thin appressed scales, and under each scale is another scale which carries the small seeds.

As observed by MacDougal (see *Journal*, New York Botanical Garden 1: 97) germination of the seeds takes place about the middle of May. The little root is provided with a very large root-cap which protects its delicate tissues at the tip as it grows down through the soil; this little root is at first bent, but soon straightens out, carrying the seed, which still contains the minute seed-leaves, up a little in the soil; the coat of the seed is soon cast away and the usually four seed-leaves expand just at the surface of the ground; the plantlet is then seen to consist of a root, seed-leaves, and a little bud immediately above the seed-leaves which at once begins growing and forms the stem, which, if nothing happens to the little plant, develops ultimately into the part of the tree above ground. The trees of the Bronx hemlock forest produce seed very unequally in different years, being apparently entirely barren at times, thus Dr. MacDougal records that no seedlings from seeds produced in 1898 were found, only two could be certainly traceable to the crop of 1897, but an enormous number were produced from the seeds of 1899. As the plantlet grows, close observations of its root will reveal curious clublike thickenings, and these are indispensable to the tree. Microscopic examination shows that they are composed of the densely matted threads of a minute fungus forming a sort of felt on the outside of these little projections. The function of these curious structures, which are known as mycorrhiza, is to absorb food from the soil, and carry it into the rootlets, from which the tree distributes it throughout its stem and leaves. Through this very interesting

method of coöperation the hemlock and many other trees receive a large share of their nutrition, and are not healthy if deprived of the mycorrhiza.

The Canadian hemlock spruce was discovered by the earliest European settlers of New England and was well known to them, as appears frequently in their literature, but it seems to have been first botanically noticed by Plukenet, in his *Phytographia*, published in 1691, where he calls it "*Abies minor pectinatus foliis virginiana, conis parvis, subtundis,*" and gives a very crude illustration of its leafy twigs and cones. The tree known to him was cultivated in the garden of Bishop Compton in London, who is recorded as having received it from Virginia through John Bannister, a collector of American plants. Philip Miller, writing in 1742, says that this tree had then been destroyed, but that the species had been "retrieved" through seeds sent him from New England, and it soon became well known in European gardens. Linnæus described it in 1763 as *Pinus Canadensis* and it was thus known by many subsequent authors; the French botanist and traveller, Michaux, recognized the tree as more nearly related to the firs, than to the pines, agreeing in this with the opinion of Plukenet, and in 1803 named it *Abies Canadensis*, and this name has also been used for it by many writers. In 1855 Carrière, a distinguished French student of coniferous trees, published a work in which he carefully described all of them known to him, and showed that the hemlock spruces were sufficiently different from both pines and firs to be grouped as a separate genus, to which he assigned the name *Tsuga*, the Japanese name of the hemlock spruce growing in eastern Asia, specifying our tree as *Tsuga Canadensis*, and it has since been known under that name.

The Bronx hemlock forest is the most southern considerable aggregation of these trees near the Atlantic seaboard. A few scattered trees and small clumps or groves grow or have grown naturally at other points in the borough, especially along the Bronx River further north and in the vicinity of Riverdale and elsewhere near the Hudson River; they become plentiful on the sides of valleys and ravines in Westchester County and in western Connecticut, as also in northern New Jersey, and from these regions northward into Canada the hemlock is an abundant forest tree; further west it grows plentifully along the whole Appalachian Mountain system as far south as Alabama, and its extreme western range is found in Minnesota and Wisconsin.

Torrey records in the "Catalogue of Plants Growing Spontaneously within Thirty Miles of the City of New York," pub-

lished in 1819, that it then grew in woods at Manhattanville, a region long since built over by the advancing city. It also occurred in woods near the extreme northern part of Manhattan Island, opposite Spuyten Duyvil. On Long Island, a few wild trees are recorded from Prospect Park, and others from Suffolk County. A single wild tree only is known in the Borough of Richmond, standing in woods near Arlington. The most southern station in the state of New Jersey is along the Delaware River near Burlington, and the tree is not known to occur in the eastern part of that state from Sandy Hook southward. It will thus be seen that the hemlock spruce is mainly an inhabitant of regions of lower average temperature than that of the Bronx, and its occurrence at our latitude is doubtless governed by local conditions. It is much more abundant and reaches greater dimensions to the north of us and in the mountains; it does not, however, extend northward into the subarctic regions and to the tops of high mountains as the firs and true spruces do, but has its northern limit in Nova Scotia and Ontario and does not ascend the Adirondacks much above 2,000 feet. The immediate relatives of our tree included with it in the genus *Tsuga* are six, three of them North American, and three Asiatic.

1. The Carolina hemlock spruce (*Tsuga Caroliniana*) found in the Alleghany Mountains from southwestern Virginia to South Carolina, differs in having larger cones, the ripe scales of which spread out from the axis, and its branches droop rather strongly; it forms a trunk up to eighty feet in height.

2. The western hemlock spruce (*Tsuga heterophylla*) has cones resting immediately upon the twigs, rather than short-stalked, as in the two eastern kinds, and is the largest of them all, becoming 200 feet high with a trunk ten feet in diameter; it inhabits northwestern America from California to Alaska, forming great forests.

3. The mountain hemlock spruces (*Tsuga Mertensiana*) is a mountain tree ranging from Montana to Washington and southern Alaska; the leaves of this tree are convex on the upper side instead of flat, as in the other American species.

4. The northern Japanese hemlock spruce (*Tsuga diversifolia*) forms mountain forests in central and northern Japan and apparently grows also in China.

5. The southern Japanese hemlock spruce (*Tsuga Araragi*) inhabits southern Japan.

6. The Himalayan hemlock spruce (*Tsuga dumosa*) is a large forest tree of high altitudes in central Asia.

By a glance at a map of the northern hemisphere, we may at once compare the regions inhabited by each of these trees and see their geographical relationships; as we have already shown, they are all either North American or Asiatic. The question at once arises why is there no European member of the genus? In reply, it may be said that there almost certainly has been a hemlock spruce in northern Europe, now extinct, for the study of fossil plant remains of the Miocene epoch, collected on the island of Spitzbergen, indicate that such a tree grew in Tertiary geologic times in the region now occupied by that island, and perhaps elsewhere in northern Scandinavia and Russia.

We now know that plants and animals of such close affinity as to be grouped in the same genus, have in most cases, at least, had a common ancestry; that is to say, all these slightly different hemlock spruces have descended from an ancient hemlock spruce almost certainly as different from any of them as they are different from each other. We also know that the climate of high northern regions was far milder during part of the Tertiary era than it now is, and also that there was complete, or essentially complete, land connection in the Arctic regions between Europe, Asia and North America. Following this warm period there came on very gradually, a long time of intense cold in the northern part of the northern hemisphere, which culminated in the glacial period, when immensely thick sheets of ice and snow covered the continent as far south as Perth Amboy, doubtless forcing all vegetation that was not obliterated to the south. The next great climatical change was a relatively warm wave of great duration, extending, indeed, into our own times, during which the plants and animals not exterminated slowly reoccupied part of their old territory, but the period of time taken by these two migrations was so great that evident changes took place in most of them; thus, instead of the tertiary parent hemlock spruce of Arctic lands, we now have the several different existing ones as its offspring in the north temperate zone.

As to the more distant relatives of the hemlock spruce, we may say that the true spruces, of which there are many kinds, differ in having four-sided leaves spreading in all directions from the twig, and that the firs, also numerous, differ in having their cones erect on the branches instead of drooping. All are natives of the northern hemisphere only, and we have but to go far enough back in geologic times to discover the common ancestry of the whole tribe.



In the collection of coniferous trees of the New York Botanical Garden, the young hemlocks are planted in the space between the elevated railroad approach and the power house; the true spruces are in the area between the conservatories and the station of the Harlem Railroad; the firs are planted on the slope between the conservatories and the driveway to the west.

Our beautiful Bronx forest signifies, then, many things, and it is hoped that this address may lead us all to appreciate, perhaps better than before, the great desirability of its safe and sure preservation, for we will view it not alone as a place of great natural charm, but as possessing educational features of high importance.

DECEMBER 14, 1905.

#### STATED MEETING.

Vice-President Schauffler in the chair.

Minutes of the last meeting read and approved.

New members elected: Chancellor Henry M. McCracken, D.D., LL.D., William T. Hornaday, Emil Ginsburger, Bernard S. Deutsch, Frank D. Hunter, Dr. John K. Small, Dr. P. A. Rydberg, Dr. William A. Murrill, Mrs. Robert Clark, Mrs. N. L. Britton.

On recommendation of the nominating committee Dr. Thomas Gaffney Taaffe and George E. Stonebridge were elected councillors.

Provision was made for the publication of the society's transactions.

#### LECTURE.

"Greek Costume as revealed in Art and Literature." Illustrated by models and slides, by Clarence H. Young, Ph.D., Professor of Greek in Columbia University.

#### GREEK COSTUME.

Greek garments for both men and women can be divided into two broad classes: (1) Those which were in part at least cut and fitted to the person and for which the generic name was *chiton*; and (2) those which were merely draped about the person and for which the ordinary name was *himation*. The references to the various garments in Greek literature, though numerous, are in the main incidental and afford little information with regard to the manner in which they were made and worn. The vase paintings