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New York Botanical Garden
BRONX PARK

DESCRIPTIVE GUIDE
TO THE
GROUNDS, BUILDINGS, AND
COLLECTIONS

NEW YORK
JUNE, 1920

PRICE, 50 CENTS

APPROACH TO ELEVATED RAILWAY STATION

NEW YORK BOTANICAL GARDEN

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Descriptive Guide

TO THE

Grounds, Buildings, and Collections

Reprinted from the

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BOTANICAL
GARDEN

DESCRIPTIVE GUIDE TO THE GROUNDS, BUILDINGS, AND COLLECTIONS

Fourth Edition*

Location

The New York Botanical Garden is situated in the northern part of Bronx Park, north of Pelham Avenue, the reservation including nearly 400 acres of land of a very diversified character, furnishing natural landscapes of great beauty and variety.

Means of Access

The Garden is conveniently reached in the following ways:

1. By the Harlem Division of the New York Central and Hudson River Railroad to The Botanical Garden Station.
2. By the Third Avenue Elevated Railway system to the terminal station of that road at Bronx Park.
3. By the Subway, Lenox Avenue and West Farms branch, with transfer at 149th Street and Third Avenue to Elevated Railway, thence to Bronx Park Station, or by the White Plains Avenue Extension of the Subway from East 180th Street to stations at Pelham Parkway and Allerton Avenue.
4. By trolley car on Webster Avenue to 200th Street or the Woodlawn Road. This line connects with lines from

* For first edition see Bulletin no. 16; for second edition see Bulletin no. 23; for third edition see Bulletin no. 34.

the western part of The Bronx on Fordham Road, and on Tremont Avenue, and also with the line to Yonkers.

5. By trolley car on the White Plains Road east of Bronx Park from West Farms, Williamsbridge, and Mt. Vernon, connecting with lines from the eastern part of The Bronx at West Farms and at Mt. Vernon.

6. By trolley car, on the Southern Boulevard to Pelham Avenue. This line connects with lines from the southern and southeastern parts of The Bronx.

7. By driveways in Mosholu Parkway from Van Cortlandt Park; from Pelham Bay Park through Pelham Parkway; through the Crotona Parkway and Southern Boulevard from Crotona Park; there are also driveway entrances at 200th Street, convenient for motor-cars coming from Jerome Avenue; at Bronx River Parkway, at the northern end of the Garden, for motor-cars coming from the north; at Allerton Avenue on the eastern side of the Garden for motor-cars coming from the east; and at the Woodlawn Road, convenient for motor-cars coming from Yonkers, and from other points west and northwest of the Garden; there are three driveway entrances from Pelham Avenue.

Purposes

The New York Botanical Garden was established by an Act of the Legislature of the State of New York passed in 1891 and amended in 1894 "for the purpose of establishing and maintaining a Botanical Garden and Museum and Arboretum therein, for the collection and culture of plants, flowers, shrubs and trees, the advancement of botanical science and knowledge, and the prosecution of original researches therein and in kindred subjects, for affording instruction in the same, for the prosecution and exhibition of ornamental and decorative horticulture and gardening, and for the entertainment, recreation and instruction of the people."

NEW YORK CENTRAL RAILROAD STATION

General Plan

A. BUILDINGS

The principal buildings open to the public are:

1. The largest botanical museum building in the world, located near the Botanical Garden Station of the New York Central Railroad and the Mosholu Parkway entrance. This building includes, in addition to the museum exhibits on the main floors, a large lecture hall for public lectures in the basement; and the library, laboratories for instruction and research, and the herbarium, on the upper floor.

2. Conservatory range 1, a large and handsome glass-house located near the Elevated Railway Station and containing plants from tropical regions.

3. Conservatory range 2, a similar building more than half finished, situated on the eastern side of the Garden near the Allerton Avenue entrance.

4. The mansion, a stone house built by the Lorillard family in 1856, stands on the east side of the Bronx River, above the waterfall. It contains meeting rooms, board rooms, horticultural laboratories, a lecture room, the collections of the Bronx Society of Arts and Sciences, the office of the Secretary of the Horticultural Society of New York, and the shops of the Garden, which are in its basement.

B. SYSTEMATIC PLANTATIONS

Containing plants arranged in botanical sequence for comparative study.

5. The pinetum, or collection of cone-bearing trees, mostly evergreens, brought together on the hills and slopes on all sides of conservatory range 1, and in the space between that structure and the museum building.

The young white pine, red pine, and white fir plantations are located south of the herbaceous garden, near the Victory Grove of Douglas spruce trees.

6. The deciduous arboretum, or collection of trees which

lose their leaves in the autumn, located along nearly the entire eastern side of the grounds from Pelham Avenue to Williamsbridge.

The salicetum, or collection of willows, occupies several acres on both sides of the river at the north end of the grounds.

7. The fruticetum, or collection of hardy shrubs, located on the plain northeast of the museum building at the Woodlawn Road entrance and extending northward into the north meadows; this collection is also arranged by botanical relationship.

The viticetum, or collection of shrubby vines, is in the edge of the forest east of the economic garden, not far from the museum building.

8. The herbaceous garden, situated in the valley east of conservatory range 1, near the Southern Boulevard entrance, containing collections of hardy herbaceous plants arranged by botanical relationship.

9. The morphological garden, just north of the herbaceous garden, designed to illustrate forms of plants and plant structures studied in elementary botany.

10. The economic garden, adjoining the morphological garden on the north, containing groups of hardy plants whose products are directly useful to man.

C. HORTICULTURAL PLANTATIONS

Containing plants that may be used for decorative purposes. The systematic plantations also contain a number of such plants.

11. Decorative woody plants in groups along the roads and paths and in various parts of the grounds, consisting of conifers, rhododendrons, flowering shrubs, magnolias, etc.

12. The Japanese cherry collection, in the valley between the river and conservatory range 2, containing over a hundred trees that flower every spring.

13. The rose garden, an area of over an acre located in

the valley west of Long Lake and not far from the Pelham Parkway Station of the Subway. Several hundred varieties of the finest roses are in bloom there from early summer to autumn.

14. The lilac garden, situated south of the rose garden on Pelham Parkway and containing a good representation of single- and double-flowered varieties.

15. Flower gardens containing a great variety of plants in bloom from early spring to late autumn. These are chiefly located in the vicinity of conservatory range 1 and the Elevated Railway Station.

16. Horticultural collections, situated south of the herbaceous garden and containing collections of cannas, phloxes, gladioli, rose mallows, and plants having variegated or colored foliage.

17. The dahlia collection, in the west border north of the Harlem Railway Station, containing several hundred of the best varieties to be obtained.

18. The iris collection, or iris garden, situated in the extreme southwestern corner of the grounds where Pelham Parkway and the Southern Boulevard meet.

19. The water garden, northeast of the museum building, containing water-lilies and other aquatic plants.

D. NATURAL FEATURES

In addition to these artificial features, the following natural features are noteworthy:

20. The hemlock forest, a grove of the Canadian hemlock spruce, clothing the hills between the museum building and the Bronx River and covering about forty acres, considerable portions of it being primeval.

21. The gorge of the Bronx River, extending south from the waterfall at the Mansion, along the edge of the hemlock grove. The river plunges through its gorge in a series of rapids passing into quiet waters before it leaves the Garden under the Linnaean Bridge.

22. The north meadows and river woods along the Bronx

River from the northern end of the hemlock grove to the northern end of the Garden.

23. Deciduous woodlands on rocky ridges in the southern and central parts of the reservation.

E. PARK FEATURES

24. Entrances.
25. Roads and paths.
26. Bridges.
27. Water supply and drainage.
28. Shade trees and border screens.
29. Shelters and pergolas.

1. The Botanical Museum

The Museum Building has a frontage of 312 feet, and in so far as now constructed, a depth of about 90 feet; the plan of this building contemplates its future extension toward the rear, so as to form a quadrangle enclosing a court. The architectural style of the building is Italian Renaissance. The walls are of light-colored brick and the trimmings of terra-cotta. It has a steel frame and concrete floors. Three floors are devoted to public exhibits, while the upper floor contains study rooms, the library, laboratories and herbarium, which may be used and consulted by permission.

The building is approached by two straight driveways and accompanying sidewalks leading from the main park driveway near the New York Central Railroad station; this front approach to the building is ornamented by a bronze fountain executed by the sculptor Carl E. Tefft, and by terra-cotta fountains and marble seats designed by R. W. Gibson, the architect of the building. The lofty steel flag-poles were donated by Mr. Edward D. Adams. The vista lines are formed by four parallel rows of tulip-trees.

The public collections in this building are:

THE MUSEUM BUILDING AND APPROACHES

MAIN ENTRANCE OF MUSEUM BUILDING

1. THE MUSEUM OF ECONOMIC BOTANY*

This occupies the entire main floor, and comprises both crude and refined products of plants used in the arts, the sciences, and the industries, as well as illustrative photographs and drawings. The specimens, at present totaling nearly 10,000, are classified primarily as products, including foods, drugs, fibers, gums, resins, sugars, rubbers, spices and flavoring-agents, dye-stuffs, tanning-materials, plant-constituents, fixed- and volatile-oils, cork, starches, and others as indicated by the accompanying floor plan. The articles pertaining to each of these primary classes are then arranged in their botanical sequence, proceeding from the lower to the higher plants.

The arrangement of the larger groups is as follows: Foods and fibers occupy the west hall, the former in cases on the north side, the latter on the south. The west wing is mainly given over to exhibits other than foods, fibers, drugs, and woods. The east hall contains the drugs, while to the east wing are assigned woods and wood-products, and a collection illustrating North American dendrology. Not all of the cases are as yet in place, additions being installed from time to time, as the growth of the Museum requires. In the following numbering, allowance is made for such additions.

Fibers. Cases 1 to 30.—In the first case of the series devoted to fibers may be found cotton, now the most important of the vegetable hairs and fibers. It is derived from the fruit of the cotton plant (*Gossypium*), being the hairs that cover the surface of the seeds. The fruits from several different kinds of cotton-plants may be seen with the cotton bursting from the capsule, while some of the many different products are also shown.

The fiber of other plants, derived from leaves, stem, bark, roots, and other organs, is of great economic importance and is used, either in practically its natural condition, as

* For more detailed information, see our Guide to the Economic Museum.

may be seen by the specimens of fans, hats, boxes, bags, baskets, mats, matting, crude ropes, brooms, ornaments, and toys; or it is manufactured into articles of commerce after processes which remove it considerably from its natural aspect or condition; for example, linen, which is made from the flax plant; cloth, twine, and rope, made from jute, hemp and abutilon-fiber; and paper made from wood and other fibers.

Cork and its Products. Case 34.—This exhibit comprises the crude cork bark and specimens illustrating its preparation for the cutting of corks; also a large number of articles illustrating its uses. Cork forms the outer portion of the bark of most woody stems. That of one species of oak, *Quercus Suber*, of the Mediterranean region, possesses peculiar properties of toughness, elasticity, and imperviousness to liquids and vapors, which make it useful for bottle stoppers. Many attempts have been made to find substitutes, but none have been found to possess an equal value. It has many other important uses. After removal from the tree, and the shaving off of its gray outer layer, it is alternately beaten with mallets and heated, to close up the natural fissures. Its removal does not injure the tree, since it will split off periodically if not removed.

The cutting of cork requires extremely sharp instruments, operated by machinery running at a high rate of speed. The substance, as we are accustomed to see it, is prepared by means of boiling the cork bark and scraping off the rough outer portion. A large jacket of crude cork is exhibited near by, just as it was stripped from the tree.

Paper Pulp and Paper. Cases 35 and 36.—Wood sections used for paper pulp, and the various stages in the manufacture of the latter are illustrated, as well as a number of varieties of paper made from such pulp.

Wood fiber, especially that obtained from the trunks of the spruce and poplar, enters largely into the manufacture of paper. In cases 35 and 36, the fiber is shown in its crude condition and in the various stages of refinement,

FLOOR PLAN, MUSEUM OF ECONOMIC BOTANY

- 1-5. Cases 1-30. Fibers
 6. Case 34. Cork and its products
 Cases 33-36. Paper pulp
 Cases 37-39. Rubber and allied products
 7. Cases 40-42. Varnish resins
 Cases 43-44. Miscellaneous resins
 Case 45. Dye stuffs
 Cases 46-47. Tanning materials
 Cases 48-51. Flavoring agents, spices, and condiments
 Case 52. Waxes
 Case 53. Fixed oils or fats
 Case 54. Soap and soap-substitutes
 Cases 55-57. Volatile oils or essential oils
 10. Case 58. Volatile oils or essential oils
- Cases 59-60. Perfumery
 Cases 61-63. Fumitories and masticatories
 11. Case 64. Fumitories and masticatories
 Cases 65-69. Beverages, including chocolate
 Cases 70-75. Proximate principles or plant constituents
 12. Case 76. Starches
 13. Cases 77-78. Sugars
 Cases 79-81. Fodder plants
 14-18. Cases 85-114. Human foods
 19-24. Cases 115-174. Drugs, including poisonous plants and insecticides
 25-28. Cases 181-195. Woods and wood products
 Case 196. Charcoal
 Case 197. Miscellaneous specimens
 29-39. Cases 199-264. North American Dendrology

as well as the various qualities of paper into the structure of which it enters. Here also are specimens of straw and other specimens illustrating the several stages and substances connected with the production of straw paper.

Rubber and Allied Products. Cases 37-39.—The first case in the west wing contains rubber and allied products. Here are the implements and utensils used in collecting the rubber “milk” from the trees which grow in tropical forests. Rubber is derived mostly from trees belonging to the mulberry family, spurge family, and dogbane family. Rubber, India-rubber, or elastic consists chiefly of the peculiar substance caoutchouc, which, in the form of an emulsion, constitutes the milky juices of many plants, existing in special milk-tubes of the bark and wood. The bark is cut or punctured, when the milk exudes and is caught in some receptacle. The milk is coagulated by various methods, mostly by subjecting it to the action of smoke, and the coagulated mass, after losing water by slow evaporation, takes on the dark color, toughness, and elasticity characteristic of rubber. Rubber is more valuable in proportion as its percentage of caoutchouc is greater, and that of its resin less. The most important source of rubber is the tree *Hevea brasiliensis*, the Para Rubber tree, native of Brazil, now very extensively planted in the East Indies.

Several varieties of rubber may be seen in the different stages of refinement, together with some articles as manufactured for the market. Here, too, are two allied products, gutta-percha and balata, which are derived from the trunks and foliage of certain trees belonging to the sapodilla family. These trees grow in many portions of the tropics.

Varnish Resins. Cases 40-42.—The varnish resins proper are mostly dug from the earth, where they have laid imbedded for ages in a sort of fossil state. Their value for varnish purposes is due to the fact that they dissolve with great difficulty, thus possessing the quality

of permanence and durability; also that they are very hard, for which reason they take and retain a high polish. Many resins of recent production and of less value, are added to the cheaper varieties of varnish. Our collection contains representatives of practically all varnish resins that are in use.

Miscellaneous Resins. Cases 43 and 44.—Resins are waste substances produced by the life processes of the plant. They are transported through the plant body in a liquid state, being dissolved, mostly in volatile oils. When the ducts or cavities containing them are broken or cut, they exude upon the surface and may then harden by the evaporation of the oil. They are collected for use by various methods, some of which are illustrated by the specimens and pictures exhibited in the cases.

Dye Stuffs. Case 45.—Many of the substances produced by the living plant and stored in its body possess colors which can be imparted to fabrics or other articles immersed in their solutions. There are others which, although themselves not colored originally, yield useful dyes when some chemical agent is added to them. All such plant substances, as well as the vegetable tissues containing them, are known as “dye stuffs.” Good illustrations are logwood, brazil-wood, madder, alkanet, and indigo, besides which, many of less importance are to be seen in our collection.

Although the use of anilin or coal-tar colors has very largely replaced that of vegetable dyes, there is still a vast use of the latter. But for the introduction of the former, it is difficult to see how the demand for colors could have been supplied under modern conditions.

Tanning Materials. Cases 46 and 47.—The tanning materials are also very important from an economic standpoint. They depend for their value chiefly upon the tannic acid that they contain, but that other constituents contribute is clear from the fact that a substance containing less tannin may be more valuable than one containing a

larger percentage. The tannin cures and toughens the skin, but other effects are required to produce the best quality of leather, especially that of "filling" the minute cavities. For this purpose, white-oak bark seems to be preeminent and this continues to be the most valued tanning substance. It has become scarce and costly, and "oak leather" now brings the highest prices. The tannins are represented by saw-palmetto, mangrove, pine, hemlock, sumac and by other products. The crude materials of the mangrove and the saw-palmetto are accompanied by their fluid extracts, which contain the tannic acid, and also by the spent material or refuse which remains after the extract has been made. This latter material may be used for other purposes.

Flavoring Agents, Spices, and Condiments. Cases 48-51. —The term "flavoring agent" is applied to any substance used to impart an added agreeable flavor to anything intended to be taken into the stomach through the mouth, or to remove or cover a disagreeable flavor in such a substance, as for instance a disagreeable medicine. The term "spice" is applied to a flavoring agent which possesses an aromatic and more or less pungent quality, such as anise, caraway, or cinnamon. By the term "condiment" is usually understood one of the more powerful agents of the preceding group, such as pepper, capsicum, mustard, or horseradish. Condiments do something more than to impart a flavor to the food. They act strongly on the nerve of taste, stimulating it to a keener sense of the natural flavor of the food. They also tend to affect the appetite and, when properly used, often to increase the digestive activity. All of these groups are liberally represented in these cases.

Waxes. Case 52.—Waxes are plant exudations, related chemically to the oils. Although they are produced by many plants, this product is usually so small that their collection is not practicable. In this way, they exist upon the surface of such fruits as grapes, plums, and some

varieties of pumpkin, appearing as a thin whitish coating, commonly called the "bloom." In the same way they occur upon the surface of many leaves. The term *glaucous* is applied in descriptive botany to such surfaces. In a few cases, wax exudes in such quantity as to be collectable in commercial quantity. This is usually done by placing the wax covered tissue in hot water, when the wax is melted and may be skimmed off of the surface of the water. A good illustration of this wax is that found upon the surface of the bayberries, illustrated in our collection.

Fixed Oils or Fats. Case 53.—Fat is a very abundant plant product, occurring more abundantly in ripe seeds than in other parts. Fats also often occur abundantly in the pericarps of fruits, especially those of the palm family. The best method of extracting oils is by a simple process of pressure, in the cold state. Such an oil, if the pressure be moderate, is likely to be quite pure. Pressure with heat is often employed, the yield of oil thus being increased. In many cases, oils are obtained by boiling the product in water, from the surface of which the extracted fat may be skimmed. In many cases, this method is liable to cause deterioration of the fat by its partial decomposition. Many oils, as those of coconut, cotton-seed, and olives, yield important food products. Many others, as linseed oil, are largely employed in paints, others in soap-making or for lubricating purposes. In other cases, as castor and croton oils, they are highly medicinal. There are vast numbers of oil-yielding products in tropical countries which are not collected, the annual wastage of such products running into enormous values.

Soap and Soap Substitutes. Case 54.—One of the most important uses of the fixed oils is for soap-making, and of the volatile oils, that of perfuming such soap. The manufacture of soap consists essentially in boiling the oil or fat with an alkali by which process the acid of the fat is caused to combine with the alkali, this product constituting soap. The glycerin of the fat is set free as a by-product.

Resins, being much like fats in their chemical nature, may be substituted for the fats, resulting in what are known as "resin soaps." In this case may be seen a series of products which illustrate the various steps in the soap-making process.

Many plants, such as soap-root and soap-bark, contain a peculiar substance called "saponin," which possesses the property of forming a lather with water, like soap. Although this is too irritating for general use upon the skin, it has great cleansing power and is largely employed as a soap substitute in the cleansing of fabrics, the removal of grease and for similar purposes. Many vegetable substances containing saponin are displayed in this case.

Volatile or Essential Oils. Cases 55-60.—These products are exceedingly numerous in the vegetable kingdom, being responsible for the fragrance of flowers and other parts of the plant, as well as for some odors which are exceedingly disagreeable to man. The volatile oils are stored in special cells or cavities and are extracted for human use in various ways, the most usual being that of distillation. This method consists in tightly packing the plant or plant part containing the oil, in a still, flooding with water and applying heat. A small quantity of the oil thus driven out of the plant-tissue is absorbed by the water. After the water has become saturated with the oil, the remainder of the latter passes off in the form of vapor, which is caught and condensed by cooling. In a few cases, as those of lemon and orange-peel oils, the oil is extracted by pressure. Volatile oils are usually rather expensive products, some of them, like attar of roses, possessing a very high money value. The following are some of the best known volatile oils. From roots are obtained the oils of lovage, elecampane, and muskroot; rootstocks or underground stems furnish the oils of calamus, ginger, orris-root, and wild ginger; herbage is the source of the oils of pennyroyal, tansy, spearmint, and peppermint; wood furnishes the material to make the oils of red-cedar

wood and sandalwood; bark is the source of the oils of birch, cinnamon, and sassafras; leaves yield the oils of hemlock, spruce, pine, cedar, eucalyptus, and wintergreen; flowers yield the oils of cloves, lilac-flower, and orange flowers; fruits yield the oils of pepper, lemon, caraway, and fennel; seeds furnish the oils of mustard, wormseed, nutmeg, and almonds; while resins give us the oils of elemi, mastic, myrrh, and frankincense.

Perfumery. The volatile oils described above are the principal substances used in the manufacture of perfumery. Very often the perfumes are made by merely dissolving one or more such oils in water, alcohol, or other substance capable of absorbing them. The oil-saturated water, produced in the distillation process described above, is itself used as a perfume. In other cases, layers of fresh fragrant flowers, as roses or violets, are pressed tightly between layers of lard or other fatty material, which absorbs the oil directly from the flowers and constitutes pomades. In some cases, oils having very offensive odors may have such odors completely changed into agreeable ones by combination with some other substance.

Fumitories and Masticatories. Cases 61-64.—The term “fumitory” is applied to any substance used for producing a smoke that is to serve some useful or desirable purpose. That now almost exclusively employed for smoking by human beings is tobacco, although various other substances are often added to the latter. A “masticatory” is a substance used for chewing. Tobacco is very largely employed as a masticatory also, but has in recent years been largely replaced by chewing gums of varying composition. In the chewing of these articles the chief or only object sought is that of exercising the jaws, but there are masticatories in use by the people of other countries which produce far more important effects. This is notably true of the coca-leaf, chewed by the natives of the South American Andes and producing very powerful and important physiological effects. Most of the important masticatories in use are shown in our collections.

Beverages, including Chocolate. Cases 65-69.—These are represented by both the alcoholic and non-alcoholic classes. Of the latter, one of the most important is pure or nearly pure drinking water obtainable from the hollow leaf-stems of the traveler's palm, from the stems of some tropical vines, from young cocoanuts, and some other plant parts. Other non-alcoholic beverages represented are tea, coffee, maté or Paraguay tea, and various fruit juices. Of the alcoholic group, malt liquors, such as beer and ale, many wines and distilled liquors are shown. In our Guide to the Economic Museum may be found suitable references to the origin and manufacture of these beverages and to their special effects on the human system.

Proximate Principles or Plant Constituents. Cases 70-75.—These cases contain the most valuable, as well as the most instructive set of collections in our Museum. A "proximate principle" of a plant, or animal, is any substance having a definite and fixed chemical composition as it exists naturally in the living body. As illustrations of such substances, we may mention starch, sugar, cellulose, saponin, castor-oil, and quinine. It will be noted that they represent nutrient as well as medicinal substances. In fact, it is the proximate principles of plants which give to them any useful properties that they possess when absorbed into the human system. When any vegetable food is eaten, it is only its nutrient proximate principles which are extracted and absorbed by the digestive organs, the remainder being excreted as waste. When vegetable substances are used as medicines, a similar process takes place. The medicinal constituent or constituents are extracted by the system and produce their medicinal effects, either on the entire body or on the particular tissue or organ for which they have their selective affinity, the rest of the plant being non-assimilant. It is often preferable, instead of giving the entire vegetable substance, either as a food or medicine, to extract the useful proximate principles and use them in their purified form. This very

large collection, generously donated by E. Merck & Company, of New York, and valued at several thousand dollars, contains all of the more important proximate principles of plants, some of them being worth as much as five or ten dollars per grain.

Starches. Case 76.—Starch is largely formed by most plants, as a reserve food supply, from the water taken in through the roots and the carbonic acid gas inhaled from the atmosphere; the chemical combination is effected by the sun's energy, directed by the green coloring matter (chlorophyl). Starch is mostly found in the form of granules, sometimes in small rods, and is easily converted by the plant, or artificially, into glucose, in which form the plant consumes it. In darkness the plant consumes starch previously formed in daylight. Starch is insoluble in water and can therefore be easily washed out from ground plant tissue. The forms of the starch grains are so constant and characteristic in each plant that they afford an excellent method of identifying the latter, even in powder. Starch, as in the case of many other substances, exists in and is consequently derived from the several organs of various plants, for example, the roots of the cassava plant furnish the cassava flour and tapioca, while those of coontie yield coontie flour or Florida arrowroot, which is quite similar to sago, and those of the sweet-potato plant furnish sweet-potato flour. The rootstocks of the common potato plant abound in potato flour, while those of the arrowroot plant yield arrowroot flour. The stems of some of the sago palms and those of some of the true palms are the sources of sago flour. The fruits, both dry and fleshy, of a great variety of plants, contain starch; for example, those of the several grains, wheat, rye, and corn; while those of the banana yield the less common banana flour. The seeds of some plants are used as a source of starch.

Sugars. Cases 77 and 78.—Sugars are formed by plants at a stage in the manufacture of carbohydrate foods, and again when the carbohydrate is used by the plant as food,

as explained on our label, in the starch case. Although many varieties of sugar are recognized, they all fall into two great classes, cane-sugar and glucose. Cane-sugar occurs mostly in stems and roots, glucose in fruits. Glucose is cheaper than cane-sugar and if pure, is more healthful for human use, but the commercial article is very apt to be impure. Glucose is mostly manufactured from corn. Cane-sugar is mostly manufactured from sugar-cane, sugar-beets and sorghum cane. Sugar is a very important plant-product and it is of vast economic value. Sugar-cane (*Saccharum*) is the basis of the world's sugar supply. The juice from the stems of the plant is boiled down and by other processes is made into the principal crude products shown in the cases and later into the commercial grades of sugar, also shown.

The juices of other plants are also used in making sugar, for example, in temperate regions, the sugar-beet yields an enormous amount, the sap of the maple tree is made into maple-sugar, while in tropical regions the sap of various palms, such as the coconut-palm and the sugar-palm, is made into palm-sugar.

Fodder Plants. Cases 79-81.—These are mostly shown as sheaves. Fodders are derived chiefly from plants of the grass and bean families. Illustrations of the former are the varieties of hay known as timothy, red-top, blue-grass, and orchard-grass. Such hays are made by cutting the plants when in bloom or early fruit, and drying entire. Another form of the same class consists of the plants of the grains, wheat, rye, oats, and corn, cut while young and dried. When dried after the removal of their grain, they constitute straw. The corn-plant, cut young, is often chopped up and stored fresh in pits and bins. Such fodder is called ensilage. The grains themselves, separated from the straw, are largely used for fodder. Illustrations of the second class are the plants of clover, vetch, lupine, meibomia, and peas, cut in a similar stage of growth and dried into hay. Fodders of this class are much more nutritious than the grass-

hays, but are not so wholesome and must be fed sparingly, especially to horses.

Human Foods. Cases 85-114.—The utter dependence of man for sustenance upon vegetable products lends exceptional interest to the consideration of plants as foods. While it is true that man subsists largely upon animal food, these animals are themselves dependent upon vegetation, so that human dependence thereon is but one step removed. It is our intention, so far as possible, to have represented in our food collection every natural vegetable substance known to be used as food by human beings, and also many of the more important manufactured food products made from such substances. In the case of cultivated products, it is not practicable to represent all of the cultivated varieties, but in all cases, a sufficient number of them are exhibited to illustrate the nature and range of variation. The number of articles in this group is so great that it has been found necessary to adopt some special method of classification and arrangement. They have therefore been grouped in the following divisions:

A. Underground Portions.

B. Aerial Stems, Buds, Leaves or Leaf-stems and Flowers.

C. Fleshy Fruits and Seeds.

D. Nuts and Seeds eaten in the dry state, such as Marrow Beans and Peanuts.

E. The Cereal Grains and a few products of similar nature. The articles in each of these classes are arranged in their natural botanical sequence, from the lowest to the highest plant.

Group *A*—cases 85 and 86—includes roots, rootstocks, tubers and tubercles, and bulbs. Although some fruits, such as the peanut, are produced subterraneously, it has been thought better to place them under fruits rather than in this group. In these cases will be found, not only such staple root-crops as potatoes, sweet potatoes, yams, taro, turnips, radishes, beets, and carrots, but also a large number of aboriginal foods, from many countries. Many of

these, while quite unknown to the general public, could probably be developed, through selection and breeding, into products of equal value with some of those now generally cultivated.

Group *B*—cases 87 and 88—includes such plant-stems as asparagus, pokeroot, and milkweed, such leaf-stems as pie-plant, celery and cardon, such buds as cabbage and brussels sprouts, leaves like spinach, Swiss chard, beet tops, and lamb's-quarters, and varieties of cauliflower.

Group *C*—cases 89 to 105—shows collections of fleshy fruits, including not only those commonly understood by this term, such as apples, grapes, and the berries, but those which, like string beans, are eaten as vegetables, but in their fresh state. It also includes seeds eaten in the fresh green state, like green peas and lima beans. It therefore comprises not only those sweet products which are commonly called fruits by the public, but also those which, like tomatoes, pepper, and okra, are eaten as table vegetables. This collection, in its entirety, is very large. Here will be found not only all the cultivated fruits of temperate regions, in many varieties, as well as those of tropical production, but also such wild edible fruits and berries as our collectors have accumulated from our own and many foreign countries. Aside from its economic interest, this group affords first-class material for the special studies of the morphologist and taxonomist.

Group *D*—cases 106 to 110—like its predecessor, contains a large number of articles in use in other countries, which are quite unknown to most persons in the United States. Prominent among such articles are some of the nuts and many varieties of beans grown in tropical countries, especially in Chile and the Philippine Islands. Of great interest also is quinoa, the seed of a species of lamb's-quarters of the Andes, constituting the principal food of the poorer classes in Chile, Bolivia, Peru, and Ecuador.

Group *E*—cases 111–114—comprising the cereal grains, is also very large, representing those of all countries, and

in a large number of varieties. Several hundred varieties of rice, chiefly from the Philippines, will be found of special interest. Of Indian corn, we show not only the highest product of modern plant breeding, but many primitive forms, not far removed from the original wild product. Dhoura or Kaffir corn is another highly important grain, little known among us except as a chicken food, but constituting the staple article of diet of millions of oriental people. Of the more common grains, such as wheat, oats, and barley, the products of different countries have been gathered, as well as sets representing the commercial grading by the New York Produce Exchange.

Drugs. Cases 115-174. Our materia medica collection is the largest in the Museum, with the possible exception of that of foods. It includes only the crude, ground, and powdered vegetable drugs, with a few constituents extracted from them. It has not been deemed advisable to include manufactured medicinal preparations, partly because of their great number, and partly because of their liability to deterioration when kept for long periods. It is not to be understood that the presence of a drug in this Museum is an endorsement, or even an indication of its value. It is recognized that a large minority, if not an actual majority of vegetable drugs that are or have been used, are either worthless or of so little value as not to be entitled to use. It sometimes happens, however, that new discoveries are made regarding the value of a drug previously regarded as worthless that reveals it as the possessor of important properties. It appears desirable also that such a collection should possess historical value, which is subserved by including in it all plants that have been considerably employed in medicine, without regard to the justification for such use.

The classification of these collections is of similar character to that of the foods. They are first grouped as underground portions, barks, woods, leaves, flowers, herbs, and twigs, fruits, seeds, and miscellaneous parts and products.

The articles of each of these groups are again arranged in the order of their natural botanical sequence, from the lowest to the highest plant.

Poisonous Plants of the Vicinity of New York. Cases 122 and 123.—While a vast majority of plants are innocuous, a number are decidedly poisonous, either to the touch or when taken into the system. Although many of them are not likely to be eaten, there are a few which, for special reasons, are very liable to be so, and which are the cause of many fatal accidents. Prominent among these are pokeroot, sometimes mistaken for horseradish, aconite root, often mistaken for the same condiment, pokeroot shoots, eaten like asparagus without proper precautionary preparation, veratrum leaves and stramonium leaves, eaten as greens, Cicuta roots, eaten for Jerusalem artichokes, and its stems, eaten for angelica, and belladonna fruits and stramonium seeds, sometimes eaten by children. Besides these, there are others which are liable to be eaten with evil results by live stock. Owing to imperfect knowledge of these poisonous species, accidents are liable to occur, on the one hand, while on the other, unjustified fear may prevent the use or handling of quite innocent plants. It has therefore been deemed desirable to have a very complete and carefully prepared exhibit of all poisonous plants, both wild and cultivated, growing in the vicinity of New York, which may be consulted or studied, especially by children. At the time of the printing of this Guide, this collection is very incomplete, so that it cannot be relied upon as a complete guide on the subject. Plans are perfected, and will be promptly executed, for the perfection of this exhibit.

Insecticides. Case 124.—Many of the poisonous plants, and some which are not so, have a wide use for the destruction of insect pests, in the house, infesting cultivated plants, or even found upon the animal body. A number of these are here exhibited and to them additions are being made as opportunity affords.

Woods and Wood Products. Cases 181 to 195.—The great number of useful woods and their more important products precludes anything like a complete representation of those of the entire world, with our present means and equipment, although it is not improbable that such an exhibit may be undertaken in the future. In the meantime, the collection will be found to contain much of interest and value, and will be extended as our facilities permit.

Charcoal. Case 196.—Charcoal is the residue remaining after driving off the volatile constituents of wood, both those which exist naturally in it and those which are formed during the application of heat, oxygen being excluded to avoid the burning of the carbon. Although charcoal is chiefly employed as a fuel, it has many other important uses, different sorts being specially applicable for certain of them. One such use is in the manufacture of gunpowder, for which purpose the carbon must be free from silica, or other crystals capable of causing sparks by friction. Another use requiring very special properties is that for the carbons of incandescent electric lamps. Certain kinds of charcoal are specially useful in medicinal preparations. Our collection of these products is at present very small, but is nevertheless of considerable interest.

Miscellaneous Specimens. Case 197.—In this case will be found a number of interesting articles not properly referable to any of the special classes above enumerated, ornaments and toys being specially prominent. Many seeds and other plant parts are employed in the making of beads and decorative articles. The ivory nut, the very hard seeds of a species of palm, is largely used in the making of buttons, chessmen and various carved articles, substituting ivory for such purposes. This collection is capable of indefinite extension as a result of visits to countries inhabited by savages and other primitive peoples.

North American Dendrology. Cases 199–264.—The collection of North American Dendrology is based on specimens of the wood of all North American trees. To the

FLOOR PLAN, MUSEUM OF SYSTEMATIC BOTANY

- 1-26. Synoptic Collection
 1-8. Case 1. Slime-moulds
 Cases 2-15. Sea weeds
 Cases 16-40. Fungi
 9-11. Cases 41-43. Hepatics
 Cases 44-50. Mosses
- 12 and 13. Cases 51-55. Ferns and Fern-allies
 12-28. Cases 56-58. Cone-bearing Plants
 Cases 59-128. Fruit-bearing Plants
 A-Z. Local Flora
 a-l. Microscope Exhibit

wood specimens are added specimens of twigs, of flowers, of fruits, and of other objects of interest from the various trees.

2. THE MUSEUM OF SYSTEMATIC BOTANY

This occupies the second floor of the building, except the west wing, and is designed to illustrate by specimens, drawings, and photographs, types of all the natural families of plants, beginning with those of the simplest structure and ending with the most complex. It consists of four series of objects:

- (a) The general synoptic collection
- (b) A series of microscopes showing selected specimens
- (c) Illustrations of the local flora
- (d) Plant photograph exhibit

(a) *Synoptic Collection.* This is designed to illustrate the plant world. A series of characteristic objects is installed as a basis for illustrating each plant-family. These specimens are accompanied as far as possible by plates, drawings or photographs, while on the shelves are arranged additional objects, such as flowers, fruits, woods, specimens of fossil plants, and models of various organs of plants, all intended further to illustrate the structural characteristics of the different groups. This collection is arranged according to the most natural and thus far most generally satisfactory interpretation of the interrelation of the plant-families; it may be considered as falling into two main series, namely, the flowerless or spore-bearing plants and the flowering or seed-bearing plants.

The flowerless plants fall into three phyla or subkingdoms: (1) the Thallophyta, in which the plant-body is not differentiated into stems and leaves, as represented by the slime-moulds, the bacteria and other micro-organisms, the seaweeds, the fungi, and the lichens (2) the Bryophyta, represented by the mosses and their immediate relatives; and (3) the Pteridophyta, including the ferns and the fern-allies.

The Thallophyta (cases 1 to 40), may be defined as plants without true roots, stems, or leaves; but notwithstanding their simple structure they exhibit an infinite variety of form and color.

The Myxomycetes or slime-moulds (case 1), standing at the bottom of the plant-scale, occupy the first exhibition case placed at the right hand side of the stairway from the main floor. They are thallophytes, having neither chlorophyl nor (in their vegetative condition) a cell-wall. These very simply constituted plants usually grow upon and derive their nourishment from decaying organic substances. They vary greatly in size, some being exceedingly minute, others assuming the form of relatively large irregularly shaped masses spreading in all directions as they grow. Most of the plants are small, and the structure is very delicate, in fact some are so fragile that a mere breath of air will ruin them.

Following the slime-moulds stand the cases devoted to the algae or seaweeds (cases 2 to 16), which may be briefly defined as thallophytes with chlorophyl, the green coloring matter of plants. The plants of this series are much more variable in form than those of the preceding, and are also much more numerous. Some forms are microscopic, others attain considerable size. The first case of the series is occupied by representatives of the blue-green algae (case 2) and the diatoms. The plants of these two groups are minute, so much so that in most cases the individuals can be well seen only with the aid of a microscope. As one finds them in nature they commonly form slimy or oozy masses which are not particularly attractive to the naked eye, but under a compound microscope they are of very great interest. Following the series just mentioned are the green seaweeds (cases 3 and 4), the group which includes the plants that are sometimes called the pond-scums, green slimes, green felts, and stoneworts. Some of these are microscopic; however, some of the green seaweeds attain a considerable size and begin to look a little more like what

are popularly termed "plants." After the green seaweeds come the brown ones (cases 5 to 8), and here the largest kinds are included. In their tissues is found a brownish pigment which obscures their green coloring matter. To this group belong the widely distributed "gulf-weed" or "sargasso-weed" (*Sargassum*) and the gigantic "great kelp" of the Pacific Ocean, which sometimes attains a length of more than a hundred feet. The seaweeds culminate in the red algae, a group in which the plants show some shade of red, pink, or purple; these (cases 8 to 15) exhibit a marvelous range of form and color. The last group of cases containing this series is given to the group of red algae which are known as the corallines, on account of their outward resemblance to the corals. These plants are thoroughly permeated with lime and are often as hard and stone-like as any coral, and build up reefs in the tropical oceans much as the corals do.

The next great type of plant life is the fungi (cases 16 to 40). These, like the plants of the preceding group, vary greatly in size and complexity of structure; but, unlike them, they are devoid of chlorophyl, the characteristic green matter which enables other plants to build up complex food for their nourishment, and consequently they are wholly different in their mode of life. Some are parasitic, deriving their nourishment from living plants and causing enormous damage to crops; others are saprophytic, deriving it from the remains of dead organisms; while others are symbiotic, living in such relationship with chlorophyl-bearing (green) plants that they mutually nourish one another, as in the case of mycorrhizas. There are five generally recognized series here: First in order are the alga-like fungi (case 16, in part); these vary in form from simple masses of protoplasm to simple or branching threads. Here belong many of the moulds and similar forms which grow both on other plants and on animals. In case 16, also, have been installed specimens and illustrations of crown-gall, an abnormal growth which is caused by minute

plants known as bacteria. This peculiar growth is commonly known as vegetable cancer on account of its close resemblance to the cancer of the human body. The disease is very destructive to trees and shrubs of various kinds. Second we have the stalked-spored fungi (cases 16 to 29). This series falls into two groups, the one typified by the "rusts" and "smuts" which are commonly parasitic on the leaves and fruits of other plants; the other the great saprophytic group, well known through the mushrooms, bracket-fungi, stink-horns, and puff-balls. Third in this series are the spore-sac fungi (cases 30 to 35). In these plants the spores are borne in delicate membranous sacs, called asci, which in the more complex forms are collected into bodies of various shapes. The plants vary greatly in size and structure and may be either parasitic or saprophytic. To this group belong the yeasts and mildews; and also the chestnut-blight fungus. This disease, which has been imported into this country, has caused the death of all of the American chestnut trees in the immediate vicinity of New York City and threatens the entire destruction of this valuable tree. Some plants grow above the surface of the ground, as in the case of the morel; while others are subterranean, as in the case of truffles. Fourth in the series is the group known as the imperfect fungi (case 36). In this group the spores are borne directly on the threads or "hyphae" which constitute the vegetative portion of the organism. They are often parasitic on the leaves and on the bark of both wild and cultivated plants. The fifth and in many respects the most interesting of all the groups is that consisting of the lichens (cases 37 to 40). The lichens have commonly been considered to form an independent symbiotic group, each lichen being supposed to consist of a fungus and an alga living together, the one nourishing the other, but, according to some of the more recent students of the group, the lichens are simply fungi that live parasitically upon algae. The lichens are quite familiar to most people as plants of more or less leathery texture growing on rocks, on poor soil, or on the trunks of trees.

A step forward brings us to the Bryophyta. These are seedless green plants, most of which possess roots, stems, and leaves, but have no vascular tissue (cases 41-50). This group is best known through the mosses, which form its largest division. Of somewhat simpler structure are the hepatics or scale-mosses (cases 41 to 43). The stems and leaves of the hepatic plant are sometimes combined into a flat thallus-like body which creeps closely on the ground or other objects and resembles in aspect some of the lichens. The leaves, when present, are usually more delicate in texture than in the true mosses and they do not have a midvein. These differences alone enable one to distinguish a hepatic from its relatives by the unaided eye or at most by the use of a lens. In addition to these characters, the capsule or the receptacle which bears the spores, or reproductive bodies, usually splits into four valves when full-grown and the spores themselves are accompanied by spiral threads called elaters. The favorite habitat of hepatics is wet places, and mountains continually steeped in clouds yield a surprising variety of forms. Closely related to the hepatics, and commonly included with them, is the group Anthocerotites; these plants may, however, be distinguished by the presence of a central axis or column (columella) in the capsule, and there are several other important structural differences in their tissues.

The mosses (cases 44 to 50) follow the hepatics in order of development and complexity; they differ from them, however, in many respects. The stem and leaves have more differentiated tissues, and the leaves usually have a midvein. The moss capsule generally opens by a lid under which there are commonly appendages to aid in scattering the spores, which in this case are not accompanied by spiral threads as they are in the hepatics. The mosses fall into three primary groups: First the "peat-mosses" (*Sphagnum*), which differ from the rest of the mosses in the development of the tissue-structure of the capsule and in the spores; they grow in swamps and other wet places,

and their accumulation forms peat. The "black mosses" (*Andreaea*) differ from both of the other groups in the valvular capsule; they grow on dry rocks. The true mosses vary exceedingly in size and aspect. An examination of the specimens in the exhibition cases will convey to the mind a better idea of this group than may be gained from a description. They grow under all kinds of conditions from dry rocks to deep water. Many of the kinds grow on almost any kind of rock, earth, or bark of trees, while certain ones are more particular as to their habitat. Some will thrive only on limestone, which they often gradually disintegrate and partially preserve in the masses of closely set plants as a calcareous tufa; other species prefer ground that has recently been burnt over, as species of *Funaria* and *Leptobryum*, while others grow only on the bones of dead animals or in places where animal refuse has accumulated.

Next higher in the plant kingdom is the subkingdom Pteridophyta, or ferns and fern-allies, the seedless plants with roots, stems, leaves, and woody tissue (cases 51 to 55). The ferns as a group perhaps attract the attention of a greater number of people than any other series of plants. Associated with what are usually known as ferns are the fern-allies, for example the "horse-tails" (*Equisetum*), "lycopods" (*Lycopodium*), and "quillworts" (*Isoetes*), but these are usually less conspicuous than the "ferns." Fern-plants differ from all the plants of simpler organization in having vascular (woody) tissue, that is, a system of vessels for conducting sap through the different parts of the plant-body. They exhibit an almost infinite variety of form; their stems may be underground, horizontal on the ground, or erect; the leaves are either simple or compound, and sometimes perform both the work of foliage leaves and that of bearing the spore-cases (ferns), while in other cases some of the leaves have become changed into mere spore-bearing organs (cinnamon-fern).

The "flowering" plants (cases 56 to 128) comprise a single subkingdom, the Spermatophyta, or seed-bearing

plants. This extensive group seems to have followed two independent lines of development and consequently the plants fall into two well-marked groups, the first being the gymnosperms, cone-bearing plants, or plants in which the seeds are borne exposed in variously shaped cones (cases 56 to 58). This is a comparatively small group, but exhibits great diversity, including plants ranging from straggling shrubs or vines to the largest trees. The leaves, too, vary from structures resembling needles or scales to expanded fern-like structures of considerable variety. In a former geological age these plants were the dominant seed-bearing plants, but now the second group of the spermatophytes largely predominates; namely, the angiosperms, covered-seeded plants in which the seed is borne in a seed-case. These plants also existed in the later geological ages, and now form the most important and conspicuous part of the vegetation of the earth. The covered-seeded plants (cases 59 to 128) fall into two divisions, the one in which the embryo has a single leaf, the monocotyledons (cases 59 to 71); the other in which the embryo has two leaves, the dicotyledons (cases 72 to 128).

(b) *Microscope Exhibit.* The exhibition microscopes occupy small stands on the mezzanine landing between the first floor and the second floor. In front of the windows on the right, if one enters by the right stairway, are shown a few of the simplest and smallest forms of plant life. Under the lenses of the first microscope are representatives of the diatoms—one-celled organisms, some of which have the power of animal-like locomotion; the living substance of each cell is enclosed and protected by a hard transparent glassy wall consisting of two halves, one of which fits into the other like a band-box into its cover. The second microscope shows attractive and varied forms of fossil diatoms from California. Following this are shown “sea mosses,” or “seaweeds,” as they are commonly known, and closely related minute plants which inhabit fresh water and belong to groups often referred to

in popular speech as "pond-scums" or "ooze." In the natural unmagnified condition, many plants of this sort seem quite the reverse of attractive, but when placed under a sufficiently powerful microscope many of them reveal a rare beauty. The "sea mosses," or "seaweeds," gradually lose much of their natural beauty of coloration on prolonged exposure to the light, but the prevailing elegance and symmetry of form and structure persist.

Following the plants of the seaweed type are several representatives of the smaller fungi. The first of these specimens illustrates the resting spores of the parasitic fungus that causes the well-known rust of rose leaves. The second shows a vertical section through the cluster-cup stage of a fungus that draws its nourishment from the living tissues of the leaves of violets. Of the fungi which live upon decaying refuse matter, *Ascobolus* is one of the more interesting among those selected for exhibition. In this, the spores, or propagating cells, are borne in groups of eight within transparent ellipsoidal sacs, and at maturity these sacs, each enclosing eight spores, are ejected with considerable force. Under the next microscope are shown sections through the gills of a common mushroom, illustrating the manner in which its very minute and numerous spores are borne.

Then follow specimens of the liverworts or scale-mosses, plants in which the differentiation of the vegetative body into stem and leaves becomes first clearly evident. One of these, a *Frullania*, has a part of each leaf peculiarly modified so as to form a reservoir for water. By aid of this device, the frullanias and their allies are able to thrive in drier situations than are in favor with most of the order to which they belong. Preparations are exhibited showing also the vegetative structure and methods of reproduction of the true mosses. Especially interesting is the "peristome" of one of the mosses, which is a fringe of peculiar appendages surrounding the mouth of the little urn in which the minute dust-like spores are borne. These ap-

pendages move about as a result of changing conditions of moisture and these mechanical movements assist in scattering the spores. A somewhat analogous device is found in connection with the spores of the equisetums or horse-tails, though the appendages in this case are attached to the spores. Near the slide illustrating this feature of the horse-tails is one showing the spores and spore-cases of the common polypody; the spore-case here is provided with a sort of spring, by the action of which the spores are violently ejected, catapult-fashion. Another preparation shows the structure of the stem of the moonwort (*Botrychium*) as it appears in a cross section. And yet another shows a cross section of the submerged stem of an aquatic plant with its large air spaces and poorly developed strengthening tissues. On the last table, at the left as one enters the landing, is a preparation showing "pollen-grains" from the flowers of a shrub of the mallow family, the grains being in this case globular and covered with small sharp points. Grains of this sort are carried by bees from the anthers of one flower to the stigma of another, thus resulting in cross-fertilization. The last slide illustrates the structure of the wood of a young pine stem in cross section and brings out clearly the anatomical basis of the annual growth rings.

(c) *Local Flora*. In this collection it is designed to illustrate every plant-species growing naturally or without cultivation within one hundred miles of New York City. For the most part specimens of the plants themselves are used, but in cases where the structure of the plants renders this method undesirable, or impossible, a photograph or a drawing is substituted for the plant-specimen. This collection is displayed in swinging frames which are placed so as to correspond in a general way to the sequence of the cases of the synoptic collection already described; thus, the first stand is near the first museum case as one enters the west hall from the top of the staircase. All of the plant groups are here represented by those members that

occur locally, and the characteristics of the several groups as mentioned under the synoptic collection also apply here.

(d) *The Plant Photograph Exhibit.* A series of over 200 enlarged photographs, illustrating plant societies, habit-characters, flower-characters, and fruit-characters of the higher plants, as well as habit and structural characters of some of the larger algae and fungi, is displayed in frames fastened to the walls of the systematic museum. As far as practicable, they have been placed near the cases containing representatives of the species illustrated. The photographs are 11 x 14 inches in size and are mounted in glazed frames, some frames containing 4 and others 6 photographs.

3. THE MUSEUM OF FOSSIL BOTANY

This collection, installed in the basement, is designed to show the successive stages of evolution through which the ancestors of our living flora have passed since the time of the first appearance of plant life on the earth, as far as the remains of extinct plants have been preserved. The general arrangement adopted is therefore based upon the sequence of the geological time divisions: Eozoic, Paleozoic, Mesozoic, and Neozoic, and their subdivisions into periods; Laurentian, Cambrian, Lower Silurian, Upper Silurian, Devonian, Carboniferous, Triassic, Jurassic, Cretaceous, Tertiary, Quaternary, and Modern. This arrangement is therefore geological, but incidentally it is also biological, and follows the same system as that on which the synoptic collection of the museum of systematic botany is arranged, inasmuch as the plants of the earlier periods are low in the scale of life, consisting of thallophytes and pteridophytes and plants of uncertain botanical determination, while those which appear in the successively later periods are of successively higher and more complex types, represented by cycads, conifers and both monocotyledonous and dicotyledonous plants closely related to our living flora.

FLOOR PLAN, MUSEUM OF FOSSIL BOTANY

Floor and wall cases	1.	Plants of Eozoic Time, Laurentian Period, and Paleozoic Time, Cambrian, Silurian, Devonian and Carboniferous Periods	Floor case	7.	Plants of Mesozoic Time, (Raritan and Cliffwood)	Cretaceous Period
Floor and wall cases 2-4.		Plants of Paleozoic Time, Carboniferous Period	Floor case	8.	Plants of Mesozoic Time, (Dakota)	Cretaceous Period
Floor case 5.		Plants of Mesozoic Time, Triassic and Jurassic Periods	Floor case	9.	Plants of Mesozoic Time, (Laramie)	Cretaceous Period
Wall case 5.		Specimens showing methods of fossilization	Floor case	10.	Plants of Neozoic Time, Tertiary Period (Eocene)	
Floor case 6.		Plants of Mesozoic Time, Cretaceous Period (Raritan)	Floor case	11.	Plants of Neozoic Time, Tertiary Period (Miocene)	
			Floor case	12.	Plants of Neozoic Time, Tertiary (Miocene and Pliocene) and Quaternary Periods	

Each specimen on display, with the exception of the very large ones, is placed upon a separate wooden block, and each one is labeled, giving the generic and specific name; the family, order, or class of plants to which it is referred; the geologic period and subdivision in which it belongs, and the locality or region where it was collected. All essential information of a botanical and geological nature in relation to each specimen is, therefore, included in the label. Whenever a figure of any specimen can be obtained this is placed on the same block with the specimen, and pictures of ideal landscapes, showing the extinct vegetation of certain geologic periods, as well as restoration of certain extinct plants, are displayed in their proper cases. The series of exhibits begins in the first cases to the left as one enters the east hall of the basement. The sequence of the specimens in the wall cases corresponds to that of the floor cases.

In floor- and wall-cases Nos. 1 to 4 may be seen representatives of Eozoic and Paleozoic Time: Laurentian, Cambrian, Lower Silurian, Upper Silurian, Devonian and Carboniferous Periods. In floor- and wall-case No. 1 are specimens of graphite of Eozoic age and of anthracite and bituminous coal of Carboniferous age, showing the transformation of vegetable matter into the ultimate condition of pure carbon in the form of graphite or "black lead" in the oldest rocks. Other specimens in this case, classed as algae, are of uncertain botanical relationship, as the structure of the primitive plants was not well adapted for preservation as fossils. For example, some organisms appear as mere filamentous strips of graphite in white limestone, without any trace of the original structure remaining, while others may be seen as casts and impressions which closely simulate in general appearance different parts of the seaweeds now existing. In this series of problematic fossils are also included a number of forms at one time definitely classed as plants but now by some assumed to be of animal or inorganic origin; namely, *Scolithus*, which

may be caused by worm burrows; *Phytopsis*, which may be a coral; *Plumulina*, which may be a hydroid; *Dendrophycus*, which may be current-markings; and Dictyolites, which are most likely sun-cracks. All of these, however, have at one time or another been definitely regarded as the remains of marine plants and were originally so described and classified.

In these cases and in wall-case No. 2 are also the remains of the earliest fern-plants and their allies (Pteridophyta) of Devonian and Carboniferous age, represented by *Lepidodendron*, *Sigillaria*, and *Calamites*, and the early seed-bearing plants, the cone-bearers (Gymnosperms), represented by *Cordaite*s, with the fossils under *Trigonocarpon*, *Rhabdocarpon*, and other genera.

Floor-cases Nos. 2 and 3 and wall-case No. 3 contain specimens of Carboniferous age, for the most part ferns or fern-like plants, which were originally described as ferns, but which are now placed in a different group, the Cycadofilicales, that is, plants that had characteristics of both the ferns and the sago-palms, but more closely related to the latter than to the ferns.

Floor- and wall-cases No. 4 are devoted to specimens of Carboniferous plants in the genera *Lepidodendron*, *Sigillaria*, and *Stigmara*, in order to show the variation in the arrangement and shape of the leaf scars and the difference between specimens with the bark preserved and those which have been decorticated.

Floor-case No. 5 contains types of early Mesozoic time: Triassic and Jurassic Periods. The plant remains in this case are mostly sago-palms or cycads, with a few cone-bearers and fern-plants, besides specimens of the so-called "*Glossopteris* flora," a flora of uncertain botanical relationship, which flourished in the transition period between Paleozoic and Mesozoic time, particularly in the southern hemisphere, and may yet be represented by the living South African genus *Stangeria*, a cycad having leaves with pinnately arranged forking veins, similar to ferns.

Floor-case No. 6 encloses plant remains from the rocks of later Mesozoic time: Lower and Middle Cretaceous Period. These specimens represent the first appearance of the higher-seed-bearing plants (Angiosperms), the type which is dominant in the existing flora. The genera are in most instances apparently identical with those now in existence, but the species are extinct. The plants of the Lower Cretaceous consist largely of ferns and cone-bearers, while those of the middle Cretaceous show a preponderance of angiosperms.

Floor-case No. 7 is arranged to show specimens of the Middle Cretaceous flora found within the limits of the City of New York, on Staten Island, or in the immediate vicinity in New Jersey and on Long Island.

Floor-case No. 8 contains specimens from the Middle Cretaceous of the western States. Those from the Dakota Group are exceptionally fine, many of them being perfectly preserved and showing both case and impression of the same leaf as counterparts.

Floor-case No. 9 is devoted to plants of the Upper Cretaceous (Laramie Group), and completes the vegetation of Mesozoic time.

Floor-cases Nos. 10 to 12 and wall-case No. 5 contain plant remains of Neozoic time. Those of the early Tertiary Period (Eocene) are displayed in floor-case No. 10. Those of the later Tertiary (Miocene) and Quaternary Periods in floor-cases Nos. 11 and 12. The specimens in the latter case complete the sequence of plant life on the earth and bring it up to modern times. A number of specimens at one end of the case show the methods of preservation by petrification, incrustation, and carbonization, and on the upper shelf is a series of specimens from Quaternary and more recent swamp deposits which show how the conversion of living plants into fossils, a process now going on, has its beginning.

The specimens in wall-case No. 5 further illustrate the characteristics of the plants of the late geological periods

and the methods by which the various plant structures have been preserved. A number of specimens of silicified woods show the method of preservation by what is known as petrification, or conversion into stone, in which the woody structure is replaced by mineral matter. Other specimens show preservation by incrustation, in which mosses and the stems of reeds are coated or incrustated by mineral matter deposited from springs; while on the upper shelf on the top of the case are logs and stumps from old swamps and interglacial deposits, in which the wood has been partially carbonized, or converted into lignite, by the slow process of natural distillation. This process represents the beginning of the conversion of vegetable tissue into coal.

LECTURES

Other features of the museum building include the large public lecture hall, with a seating capacity of over seven hundred, which occupies the western end of the basement. It is equipped with an electric projection-lantern, and free public popular lectures covering a wide field of botanical and horticultural subjects are delivered here on Saturday afternoons from spring to autumn; these are fully illustrated by means of a very extensive collection of lantern slides owned by the Garden which is constantly being increased. A noteworthy part of this collection is the series of delicately and accurately colored slides of flowers, fruits, trees and shrubs, by Mrs. Adelaide S. Van Brunt, from photographs made during many years by her late husband, Cornelius Van Brunt.

The Horticultural Society of New York holds several of its monthly meetings at the Garden, using the large lecture hall, and also uses the basement museum hall adjacent for the purpose of exhibitions.

The Torrey Botanical Club holds monthly meetings from October to May, on the afternoon of the last Wednesday of each month, in the museum building, and several of its field

PLAN OF UPPER FLOOR OF MUSEUM BUILDING

1. Library Reading Room	7. Storeroom	14. Herbarium Extension
2. Library Stack Room	8. Main Herbarium	15. Study
3. Director's Room	9. Hall	16. Study
4. Herbarium of Ferns and Lichens	10. Photographic Dark Room	17. Physiological Dark Room
5. Curator's Room	11. Work Room	18. Botanical Laboratory
6. Moss Herbarium	12. Chemical Laboratory	19. Library Extension
	13. Study	

meetings on Saturday afternoons throughout the season are held at the Garden.

THE LIBRARY

The library of the Garden is located in the center of the upper floor of the museum building, and is available for consultation, by permission. It has been formed by the Board of Managers in order to provide for the use of students, all the literature of botany, horticulture and related sciences, and is rapidly becoming one of the most complete collections of books and pamphlets in the world dealing with these subjects. It consists of a reading-room, circular in shape, and two stack rooms opening off from it. The collection contains over 30,000 bound volumes.

In addition to its own books, the library has on deposit many of the botanical works belonging to Columbia University and the New York Academy of Sciences.

The Cox collection of Darwiniana, named in honor of the late Charles Finney Cox, by whom the collection was made, consists of a complete set of the works of Darwin. These books occupy a specially constructed cabinet which stands near the center of the reading room.

Manuscript letters of botanists, as well as many portraits of botanists, are also on file.

THE HERBARIUM

The herbarium consists of dried specimens of plants systematically arranged in cases; it occupies the greater portion of several rooms on the upper floor of the museum building, and is available for consultation by permission. It contains prepared specimens of all kinds of plants from all quarters of the globe, and is the most extensive and complete collection of its kind in America. It comprises the Garden herbarium and the Columbia University herbarium. The latter is one of the oldest collections of its kind in the United States, having been begun by Dr. John Torrey

soon after the commencement of the last century. After half a century of natural growth several large herbaria were incorporated in it and large sets of special collections were added to it. The Garden herbarium was begun with the inception of the Garden. It has grown rapidly and now far excels the Columbia herbarium in the number of specimens. The rapid growth of the Garden herbarium and its importance is due to the fact that it is built up of approximately thirty different herbaria which represent plants of all groups from all parts of the globe. To this as a basis have been added miscellaneous collections and the first sets of the plants secured by members of the Garden staff while exploring in different parts of the New World and the Old.

The great majority of specimens are mounted on herbarium sheets, but many thousand specimens, such as bulky fungi, fruits, seeds, and other parts of plants not suitable for placing flat on herbarium sheets are contained in cardboard boxes of multiple sizes.

The herbarium now comprises more than one and one-half million specimens. All groups of the flowerless plants and flowering plants are copiously represented.

THE LABORATORIES

Laboratories and working rooms for research are provided on the upper floor of the museum building, and properly qualified students of botany are permitted to make use of this equipment, under the direction of some member of the staff of the Garden. The equipment is designed to meet the needs of a very broad field of investigation, including plant chemistry, pathology, physiology and morphology. An experimental garden and greenhouse at the nurseries are used in connection with the laboratories. A valuable series of old microscopes, illustrating the history and development of that instrument, was presented by the late Mr. Charles F. Cox.

PUBLIC CONSERVATORY RANGE 1, AND FLOWER GARDENS

2. Public Conservatory Range 1

This great glasshouse, located but a short distance from the 200th Street Station of the Third Avenue Elevated Railway, is 512 feet in length, with a central dome about 90 feet in height, and wings extending from the main range in such a way as to form a court open to the southwest. The area under glass is about one acre. The building stands on a terrace 5 feet in height, approached by six flights of cut granite steps connecting with the path and driveway approaches. The house contains fifteen compartments, separated by glass partitions and doors.

Fig. 1. Ground plan of Conservatory Range 1.

House No. 1 contains palms of numerous species from all parts of tropical and warm regions, both of the Old World and the New. Of West Indian palms, the collection contains the royal palm of the West Indies, Florida, and Panama; an elegant plant of the corozo palm (*Acrocomia aculeata*) of Jamaica, Porto Rico and the Windward Islands; and the cocoanut palm, planted in all tropical countries for its fruit and for the numerous uses to which its fiber, wood, and leaves are applied—it is not definitely known that the cocoanut palm is a native of the West Indies, and where in the tropical regions it actually originated is uncertain. Other tropical American palms are illustrated by the silvertop palm (*Coccothrinax argentea*), of Florida and the

West Indies and by the curious Mexican *Acanthorhiza aculeata* with spine-like roots on its trunk. Old World species are shown in a very large tree of the Chinese fan-palm, and by numerous other large species from the Pacific islands. Another Old World palm is *Calamus asperimus*, of Java, curious in its climbing habit; the specimen here is over one hundred and seventy feet long; the long tail-like appendages to the leaves, which have backwardly turned spines, enable the palm to climb on surrounding vegetation. Related to the palms and shown by numerous specimens in this house, we find a number of species of the Panama hat-plant family, the most conspicuous being the Panama hat plant (*Carludovica palmata*), from the young leaves of which the costly Panama hats are made. Opposite the entrance to the court is a plant which belongs to the grass family, the Chinese bamboo (*Bambos vulgaris*), whose stems reach into the upper part of the dome; this plant grows with great rapidity each year by new shoots which come up from under ground, our measurements showing that they reached 65 feet in height in 95 days, a rate of about 8 inches a day. The plant has been introduced into the West Indies, and in places where it grows its stems are put to a great variety of uses in construction, for water pipes, and for various utensils.

Houses No. 2 and No. 3 contain a collection of exogenous tropical plants. These are arranged in botanical sequence, the families appearing to the right or left of the walk, or both, as cultural conditions require, the sequence beginning at the east end on the north side, proceeding to the west end of house 3 and returning on the south side of the two houses, and terminating at the east end of house 2. On the right, as one enters from the north door from house 1, is a collection of the pepper family, Piperaceae. These are largely of the genus *Peperomia*; many of these plants have been collected by Garden expeditions to the West Indies. Plants of the genus *Piper* are usually large, and the larger ones will be found in the center nearby.

The nettle family follows, represented by such plants as the odd *Procris*; *Pilea*, in several species, including *P. microphylla*, the artillery plant; the Gyrupia poison-tree, a native of Australia, one of the most vicious of the stinging nettles—at fruiting time the dull purple of its fruit makes it quite attractive; and the two-lobed *Boehmeria*, from Japan. The flat-stemmed *Muhlenbeckia*, native of the Solomon Islands, belongs to the knotweed family. As one proceeds, many species of figs will be found, including the common rubber plant of our homes. Further on is the laurel family, one of the interesting plants belonging here being the alligator pear, the fruit of which is edible and much used as a salad, and otherwise, in the tropics. Near this is the custard-apple family, including the cherimoyer, an edible fruit, native of tropical America. Nearby are the senna and mimosa families, represented by numerous individuals. To the senna family belongs the poinciana, commonly grown in Florida and tropical countries on account of its decorative red flowers. To the mimosa family belong the sensitive plants, of which there are two here which show this characteristic noticeably, *Mimosa pudica* and *Mimosa Spegazzinii*.

Near the west end of house 3 is a collection of the spurge family. Here will be found the genus *Codiaeum* in many colored forms, usually known as garden crotons. Other genera represented are *Croton*, *Phyllanthus*, *Xylophylla*, *Antidesmia*, and *Acalypha*. Here, also, are two plants of the curious West Indian ivy, belonging to the genus *Marcgravia*. On the south bench of this house is a large collection of begonias. Entering house 2, the north side of which we have already visited, we find more begonia plants on the south bench, and nearby the meadow-beauty family, largely represented in tropical regions, to which belongs our native meadow-beauty, *Rhexia virginica*. Other families following are the vervain, acanthus, potato, madder and thistle, the last two near the east door.

House No. 4. Here are brought together many kinds of large tropical plants belonging to families also represented in the smaller houses, but too tall to be grown on the benches.

In this house may be found large specimens of the aroid family, the most noteworthy one of these being a magnificent plant of Veitch's tail-flower (*Anthurium Veitchii*), from Colombia, which is believed to be the most elegant plant of its kind in cultivation; climbing on trunks of trees set as supports, will be found a number of vines of the genera *Philodendron* and *Monstera*, one of these, *Monstera deliciosa*, a Mexican plant, producing an edible fruit, with the odor of pineapple. Another is *Monstera lativaginata*; the early leaves differ widely from the mature ones. The main aroid collection will be found in house 10, and other plants at range 2, houses 16, 18, and 20.

A large tree of the common rubber plant, much grown in parlors, may be found in the center of this house, reaching to the roof; this is a native of tropical Asia and yields some rubber, but not in as great quantity nor of as good quality as the other rubber trees of South and Central America; it is a species of fig (*Ficus elastica*); other species of *Ficus* are shown in this house, notably a fine tree of Roxburgh's fig, which bears its inedible fruit in bunches near the base of the tree, and a specimen of the Banyan tree (*Ficus benghalensis*). Chocolate trees (*Theobroma Cacao*), native of tropical America, may be found here; the small white flowers are produced on the trunk and on branches, and a few of them develop into the large woody pods containing the seeds or chocolate beans, which are dried and ground up into chocolate and cocoa; specimens illustrating the chocolate industry will be found in the economic museum. The papaya, or papaw, also of tropical America, is here also; its fruit, esteemed as an aid to digestion, is borne just under the crown of leaves. A specimen of the bread-fruit tree (*Artocarpus incisa*) may also be seen here; originally from the islands of the Pacific, it was introduced into the West Indies in the latter part of the eighteenth century.

Several interesting tall vines climb on the pillars of this house, and on supports along the sides, among them the night-blooming jessamine (*Cestrum Parqui*) of tropical America, which opens its flowers after dark and exhales a delicious perfume, the flowers remaining open during part of the morning; Henderson's *Allamanda*, of Brazil, with its showy large yellow flowers, climbs to the roof.

House No. 5. The plants in this house are from desert regions. Especial attention is called to their fleshy stems or leaves which serve as storage organs for a water supply to carry them over periods of drought. On the right hand bench, as one enters from No. 4, are mainly plants from southern Africa: the carrion flowers (*Stapelia*), relatives of our common milkweed of the roadsides; *Gasteria*, *Haworthia*, and other South African representatives of the lily family; and the fig-marigolds, *Mesembryanthemum*, belonging to the carpet-weed family.

On the end of the center bench, opposite to the entrance from house 4, is the collection of the fleshy members of the spurge family, Euphorbiaceae, mostly natives of the Old World. These closely resemble forms of the genus *Cereus* and related genera of the cactus family, to be found in houses 6 and 7. In fact, the adaptation to an arid environment, by the thickening of stems or leaves, is strikingly illustrated in the plants of several families contained in the collections in houses 5 to 8. On the center bench are the aloes, mainly South African members of the lily family. A part of the center bench and the side bench on the east side are devoted to members of the orpine family, many of these interesting and beautiful forms. The echeverias from Mexico and Central America, and the sempervivums or house-leeks, from the Old World, are conspicuous among these. Among other genera represented are *Sedum*, *Kalanchoë*, *Pachyphytum*, and *Crassula* (in house 6 are large specimens of *Crassula portulaca*). Many of the stone-crops are hardy plants, and a collection of these may be found at the herbaceous grounds. A large number of

specimens belonging in this house and in the three following ones may be found during the summer in the beds in the conservatory court.

House No. 6. This is also a desert house. On the corner benches is a collection of century plants (*Agave*), a large genus known only from the New World; other and larger plants of this same genus may be found in the central portion of the house. Conspicuous among these are: the thread-bearing agave, Queen Victoria's agave, the sisal plant (*Agave sisalana*), and the common century plant (*Agave americana*). The first two are decorative and curious; from *Agave sisalana* is manufactured the sisal hemp of commerce; the last, *Agave americana*, is well known, and it is from the sap of related species that the Mexican drink "pulque" is obtained by fermentation. It is popularly believed that the century plants flower but once in a hundred years, and then die; it is true that the plant dies when done blooming, but it blooms at a much earlier age than a century, sometimes when but eight or ten years old. The collection of West Indian agaves is especially rich in species.

A group of the dracaena family may be found in the central portion of this house. This comprises members of the genera *Yucca* and *Dasylyrion*. A group of cacti may also be seen here, the most imposing figure of which is the giant cereus, *Carnegiea gigantea*, known as "sahuaro" by the Mexicans and Indians of its native country, Arizona and Sonora. The plants here shown were obtained by an expedition sent to those regions by the Garden in 1902, and are the largest specimens in cultivation in the east. Several large specimens of the hedgehog cactus, secured at the same time, form part of this group; the Indians in the desert often secure a supply of drinking water from these plants by cutting off the top and macerating the interior substance.

Houses Nos. 7 and 8 are wholly occupied by the cactus family. The collections here have been greatly enriched

and enlarged in the past few years by extensive explorations made in South America, in cooperation with the Carnegie Institution, and from other sources. These collections, the richest in species in the world, have been assembled to facilitate the production of a monograph on this family now in course of preparation by the Garden in cooperation with the Carnegie Institution. In addition to the plants in these houses, many hundreds of others are located at the propagating houses. Nearly all these plants are devoid of leaves, these organs, when present, being mostly small and inconspicuous; in the genus *Opuntia* they are usually present on the young growths as awl-shaped bodies, while in some few species they are much larger and remain for some time; in the genus *Pereskia*, specimens of which will be found in house No. 8, the leaves are large and well developed. The stems of the cacti are fleshy and assume a great number of forms: in *Opuntia* the stem is composed of joints, either cylindric or broad and flattened; in *Cereus* and related genera the stems are angled; in *Carnegiea* they are thick, massive columns with many longitudinal ribs; in *Echinocactus* the plant-bodies are but little elongated, or almost globular; while in other genera the plant-body is covered with rows of spirally arranged projections. The flowers of many cacti are exquisite in form and color; they are borne on various parts of the plant-body, in the Turk's-head cactus on a curiously modified portion of the top.

In house 7 on the center bench is the genus *Cereus* and its many related genera, *Pachycereus*, *Cephalocereus*, *Leptocereus*, *Acanthocereus*, *Nyctocereus*, *Hylocereus*, *Selenicereus*, *Harrisia*, and others. Among these is the old-man cactus, *Cephalocereus senilis*. On the west and north side benches is a collection of the genus *Epiphyllum*, often known as *Phyllocactus*. The broad flattened parts of these plants are stems and not leaves, the flowers being borne in the notches along their edges. The flowers are very showy, many of them beautiful in the extreme. On the south

and west side of the center bench are plants of the hedgehog cactus, *Echinocactus*, and also of *Echinocereus* and *Echinopsis*. On the south bench is a collection of cactuses, largely of the genus formerly known as *Mamillaria*. Here also will be found specimens of *Echinocereus*, *Echinocactus*, and of the curious Turk's-head cactus which bears its flowers on the red cap to the plant, hence its popular name.

House 8 is mainly devoted to the collections of the genus *Opuntia*. On the center and north benches are the platyopuntias, those with broad flat joints, while on the south bench will be found the cylindropuntias, or those with rounded stems. Among the platyopuntias are a number of plants of Burbank's so-called spineless cactus; these were obtained direct from Mr. Burbank in 1912, and it is curious to note that many of them are now developing spines. It is claimed that these plants are valuable for fodder in arid regions. As already remarked above, the leaves of the opuntias are usually small and awl-shaped and occur on the young growths. In this house will also be found the genus *Pereskia*, in which the leaves are normally developed. One of the commonest of these is the Barbados gooseberry, *Pereskia Pereskia*, of tropical America. *Pereskiaopsis* is a related genus of which a number of species will be found here; its leaves are also well developed.

An interesting economic plant in this house is *Nopalea coccinellifera*, upon which the cochineal insect breeds; it is from these insects that the dye cochineal was obtained. *Nopalea* much resembles the flat-stemmed *Opuntia* in its plant body, but is distinguished readily by its different flowers.

Few of the cacti are of economic importance. A number of different kinds are used for hedges in tropical America. Certain species of *Opuntia* produce edible fruits known as Indian figs. These are offered for sale in the fruit stores in New York at the proper season. In the island of Grand Turk certain species of *Opuntia* which grow there are used in making a soup, known as pear soup, the young joints of the plant being used for the purpose.

House No. 9. This is the aquatic house, and plants which find their homes in the water or require much moisture are brought together here. From the bridge spanning the pool the various features may be readily observed. Fringing the pool on the right, as one enters from house No. 10, are members of the sedge and grass families, while on the left hand side the fringe is made up entirely of grasses, largely of the graceful bamboos. Of special interest among the sedges is the Egyptian paper-plant (*Cyperus Papyrus*), from which many of the ancients obtained their writing paper. Among the grasses by far the most important is the sugar cane (*Saccharum officinarum*); from the lower portions of its stalks the juice is extracted by pressure, and from this juice molasses and sugar are manufactured. Among the plants in the pool are many with attractive flowers; conspicuous among these being water-lilies (*Castalia*), of which there are several different kinds; the water hyacinth; the parrot's-feather, with its delicate feathery masses of green; the water poppy; the water snowflake; the water lettuce and golden-club, members of the arum family; the floating fern; and some odd little plants related to the ferns, members of the genus *Salvinia*.

House No. 10 contains specimens of the aroids, represented by a large number of different species, located on and under the benches. The plants of this family (*Araceae*) are mostly of tropical distribution, but they are represented in our northern flora by the skunk cabbage, the jack-in-the-pulpit, and the sweet flag; the most familiar one in cultivation is the calla lily (*Zantedeschia aethiopica*), not botanically a lily. The plants all have spikes of very small flowers closely massed together, and usually subtended by a broad leaf-like structure which is known as the spathe; this is usually highly colored, pure white, yellow, red or scarlet, and is commonly thought of as the flower, though not botanically so; species of *Anthurium*, known as tail-flowers, are abundant in the West Indies and tropical America, as is the genus *Philodendron*, signifying tree-loving, on account of

many species being vines climbing high on the trees in tropical forests; numerous species have underground stems and branches which contain much starch and are cultivated in the tropics for food, under the name of yautias and taros. Plants of the same family, too large for exhibition in this house, may be found in house No. 4. Others will be found at range 2, houses 16, 18, and 20.

House No. 11. Here are brought together many kinds of tropical plants belonging to the banana, ginger and canna families. The collection of bananas and their relatives occupies the greater part of the space and one or more of the specimens is usually in fruit; the collection contains both the edible, commercial bananas and the plantains, and also several species whose fruit is not edible, but in which the interest lies in their decorative leaves and flowers. The stems and leaves of all these plants contain some fiber, which is produced in enormous quantities in the Philippine Islands from *Musa textilis*, and is the well-known Manila hemp. The supply of fruit for the United States comes mostly from Central America and the West Indies, and some from northern South America. Bananas will grow in southern Florida, but the rocky soil of that region is not well adapted to their cultivation. The traveler's tree, from Madagascar, is shown in several fine specimens, and gets its English name from the fact that the axis of each long leaf-stalk contains a great deal of water which can be tapped and drunk. The bird-of-paradise plants, which take their name from their gaudy flowers, will be found in this group; they are natives of southern Africa and belong to the genus *Strelitzia*. Another genus of the banana family, *Bihai*, is also represented by several species, called wild plantains, natives mainly of tropical America.

Here also may be found several species of the genus *Costus* and of other genera of the ginger family, including the ginger plant (*Zingiber Zingiber*).

House No. 12 contains specimens illustrating several families of monocotyledonous plants of tropical regions. The

amaryllis family is represented by a number of species of the spider lily (*Hymenocallis*), bearing large white flowers, the commonest being *Hymenocallis expansa* from the sandy coasts of the West Indies; large plants of the genus *Crinum*, some of which have white flowers and some red or purple, may be seen here, and the maguey (*Furcraea*) of the West Indies (a spiny-leaved relative of the century plant, native of the West Indies, and used there for hedges); this name maguey is also applied in parts of the West Indies to species of *Agave*, which will be found in house 6.

Numerous representatives of the dracaena family, many of which are used for ornamental planting in the tropics, are in this house. Larger plants of this family will be found in house 13 adjoining. The collection of the genus *Sansevieria* is also located here; many species yield a tough and valuable fiber from the leaves; they are commonly referred to as bowstring-hemp.

The interesting screw-pines, natives of the Old World tropics, are illustrated by several species, the leaves of which are used in the manufacture of mats, hats and baskets. These plants are not at all related to pine trees, the latter part of the name referring to the slight resemblance the leaves bear to those of pineapple plants, which are commonly called *pines* in the tropics, while the remainder of the name was suggested by the spiral arrangement of the leaves. Larger specimens will be found in house 13 adjoining.

The tacca family, *Taccaceae*, is here represented in two genera, *Tacca cristata* and *Schizocapsa plantaginea*. This family is closely related to the amaryllis family.

The arrow-root family is illustrated by the arrow-root (*Maranta arundinacea*), native of South America, but widely cultivated in the West Indies, its roots furnishing the commercial product; *Calathea* comprises a large number of tropical American plants noteworthy for their fine foliage; and there are other genera represented.

House No. 13. This house contains largely temperate

palms, or other palms which will thrive under temperate conditions. Here is the dwarf fan palm (*Chamaerops humilis*), of the Mediterranean region; the genus *Howea*, native of Lord Howe's Island, and commonly known among florists as *Kentia*; the date palm (*Phoenix dactylifera*), of northern Africa, and other related species; the palmetto (*Sabal Palmetto*), of our southern states; and perhaps the most striking of all is the fan palm of the California desert (*Neowashingtonia robusta*), in four fine specimens. Large specimens of the screwpines (*Pandanus*), and of the genera *Dracaena* and *Cordyline* find a place here; smaller plants will be found in house 12 adjoining.

One of the most imposing plants here is *Araucaria Bidwillii*, a native of Australia, where it is known as bunga bunga; the members of the genus *Araucaria* replace in the southern hemisphere the pines of the northern. Other specimens of *Araucaria* will be found in the Central Display House at Range 2.

The gum-trees of Australia and Tasmania (*Eucalyptus*) are represented in two plants; these trees occur in large forests, and sometimes attain a height of 200 to 400 feet. There is also a specimen of the camphor tree (*Cinnamomum Camphora*), from which the camphor of commerce is derived. There is a tea-plant (*Thea sinensis*), the commercial plant from which is obtained our beverage tea; black and green tea are obtained from the same plant, the difference in color being due to the method of preparation; the tea-plant is extensively cultivated in many warm and tropical countries, having been used as a beverage by the Chinese from time immemorial; its first introduction into Europe is said to have been by the Dutch in 1610.

On the columns or against the walls will be found a number of vines. Among these is the yellow jessamine (*Gelsemium sempervirens*), of the south; it sends out its bright yellow flowers in February, and they persist for several weeks. Among others there are the following: Cherokee rose (*Rosa laevigata*); *Bougainvillea* in two

COURT OF PUBLIC CONSERVATORY RANGE I

species, the bracts surrounding the small flowers being bright magenta colored or red, making of the plant when in bloom a gorgeous show; the flaming bignonia (*Pyrostegia venusta*); the blue bignonia (*Clytostoma callistegioides*); and the large-flowered Solandra (*Solandra grandiflora*), a native of tropical America.

Houses Nos. 14 and 15. In these two houses are the smaller specimens of the palm family and Panama-hat-plant family, the larger plants being in house 1. On the north bench in house 14 is a collection of plants of the Panama-hat-plant family.

CONSERVATORY COURT

There are three attractive features here during the open season, viz., the display of tulips in the spring, followed by the collection of desert plants, and the water-lily collection. The water-lilies may be found in two pools, one in each end of the court. In the easterly one are placed the hardy sorts, such as are able to withstand the severe cold of our winters, which remain permanently where they are, winter and summer. In the westerly pool are the tender kinds, or such as require protection during the winter; many of these are stored in a warm place during winter and placed on view again in the spring. The most conspicuous of the tender sorts is the royal water-lily from Paraguay; this is not hardy in this climate, and, as it is too large to protect from the cold, is grown anew from seed each year; the seeds are sown in the propagating houses late in winter, and the young plants placed on view late in the spring or in early summer.

In summer the collection of desert plants is in the beds in front of the entrance to house No. 1, usually occupied by tulips during the spring. The central bed contains American desert plants only, made up largely of members of the cactus, amaryllis, and dracaena families. The bed paralleling this to the west contains a collection of

cacti, members of the genera *Nopalea* and *Opuntia*, the latter prickly pears, with flat stems or joints, all natives of the American desert. In a bed paralleling this on the opposite side of the central bed is a collection of desert plants from southern Africa. Placed transversely to this is a small bed with desert plants of one family, containing representatives from both the Old World and the New. A corresponding bed on the other side of the court is devoted to desert plants from the Old World. Near to this is a small bed containing plants of the genus *Opuntia*, those with round stems or joints and the tree-like forms. In the corresponding bed on the other side of the court is a collection of desert plants belonging to the spurge family.

3. Public Conservatory Range 2

This range is located on the easterly side of the grounds, a short distance from the Allerton Avenue Station of the Subway, and in the midst of the deciduous arboretum. Only the central transverse part and the houses north of it have been completed, consisting of the central display house, placed transversely to the long axis of the completed range; four lower houses, at a right angle to this, about 140 feet long, of which two are divided into two compartments each; and another section, about 156 feet long and 28 feet wide, parallel with the central display house and connected with it by the four lower houses above mentioned, and divided into three compartments. Connecting the long north and south houses are smaller houses, nos. 4, 8, and 12, used for potting and other preparatory purposes. The main entrance to this range is at the east end of the central display house.

In this range will be found the greater part of the collections of temperate plants, those which are not hardy in our climate but require cool cultural conditions; the collections of the orchid, pineapple, and fern families; the collection of cycads; the collection of pitcher plants; and some representatives of the arum family.

PUBLIC CONSERVATORY RANG

VIEW IN CENTRAL DISPLAY HOUSE, CONSERVATORY RANGE 2

Central Display House.—This house, the gift of Messrs. Daniel and Murry Guggenheim, has a length of about 170 feet, a breadth of 47 feet, and a height of 35 feet. The central portion is designed for the purpose of giving

Fig. 2. Ground plan of Conservatory Range 2, so far as completed.

lectures on botanical and horticultural subjects, the large collections of living plants furnishing illustrative material. This portion is provided with a cement floor about 58 feet long and 47 feet wide. Flower shows may also be held here, the excellent light and the cool conditions maintained being well adapted to this purpose.

Here is being brought together a collection of temperate plants, natives of the warm temperate regions or of the higher mountainous portions of the tropics. Passing in through the main entrance, immediately in front will be found a group of acacias, mostly natives of Australia, although some few are of hybrid production. When in full bloom, which occurs usually from mid-winter to early spring, they are beautiful in their profusion of yellow blossoms. Back of this group is a miscellaneous collection, including a large specimen of *Podocarpus Purdieanus*, a native of Jamaica, and a large plant of *Araucaria Bidwillii*, the bunga bunga of Australia, its native country. At the other end of the house are groups comprising in part members of the pine family, such as *Araucaria*, *Juniperus*, and *Pinus*; there are also plants of the yew family, represented by *Podocarpus*, and a number of species of the myrtle family in the genera *Callistemon*, the bottle brush, *Myrtus*, the myrtle, *Eugenia*, and others. In this house is also a plant of the olive tree (*Olea europaea*), which is a native of the Mediterranean region and the Orient, but has now been largely introduced into cultivation in other warm countries; in the middle of the 18th century it was first introduced into California, at San Diego, it is said, and is now largely cultivated in southern California. Other interesting plants here are: the oleander, in the flowers, leaves, and especially the bark of which occurs a poisonous principle; the crepe myrtel (*Lagerstroemia indica*); the edible fig (*Ficus Carica*); and the pomegranate.

House No. 2. This house and compartment *B* of house 6 contain the orchid collections. The orchid family is widely distributed, occurring in all tropical regions, but finding its greatest development in the Old World in India and the Malayan region, while in the New World its greatest numbers occur in Brazil and other parts of northern South America. In temperate regions relatively few species are found, while in very cold countries they

are entirely absent. Most of the tropical forms are epiphytes, that is, they grow upon trees and usually have bulb-like or thickened stems and fleshy leaves for the conservation of their water supply, as, from their habitat, this supply must be precarious. In temperate regions nearly all of the species are terrestrial, and have thin leaves, the soil about their roots serving to protect them from the cold and also giving them a more constant water supply; they do not, therefore, need pseudobulbs or thickened stems. Coming from all parts of the world as they do, their blooming time varies greatly, so that at almost any time of the year, be it winter or summer, some of these interesting plants may be found in bloom.

This house is the gift of Messrs. Daniel and Murry Guggenheim. It has a length of 140 feet and a breadth of 29 feet. It is divided into two compartments, *A* and *B*.

In compartment *A* are the orchids requiring cool conditions. Here will be found: *Coelogyne cristata* and *Paphiopedilum insigne*, of the Himalayan region, the latter species with many color variations, and one of the exceptions in a genus usually requiring the conditions of a stove house; some species of the genus *Epidendrum*; *Lycaste*, an American genus; *Odontoglossum*, also of America; *Oncidium*, a large genus of tropical America, with a maximum development in South America; *Masdevallia*, in large part, a genus of great altitudes in the American tropics; *Pleurothallis*, with much the same distribution as the preceding genus, many of the species being very small, some only a half inch tall; and *Pleione*, of the Old World.

In compartment *B* are those requiring intermediate conditions as to temperature. Here, among others, will be found the genera: *Cattleya*, in most part, native of America only; *Epidendrum*, in part, also a large American group; *Laelia*, of American distribution; and *Oncidium*, in part, likewise American.

House No. 6. This house is the same length as house 2, but is only about 21 feet wide, and is a little lower. It is also divided into two compartments, *A* and *B*.

In compartment *A* is the collection of the pineapple family. These are mostly plants which live on the trunks and branches of trees in tropical forests, and are therefore called epiphytes, signifying plants growing upon other plants; many of them are exceedingly beautiful in foliage and in flower; the so-called Florida moss, or Spanish moss, clothes the trees of the live-oaks in the southern Atlantic States, and is not a moss at all, but a plant bearing small flowers which show its relationship to others of this family. The pineapple itself, doubtless the most familiar member of this group, has been cultivated in tropical regions for an indefinite period for fruit, and is not certainly known in the wild state; the pineapple fruit is the ripened bunch of flowers which forms at the top of the stem; the plant is propagated by cutting off the tuft of leaves, which is found on the top of the fruit, and by suckers which sprout from the side of the plant near the ground; it is an exception to the tree-loving habit of most of the family, in growing on the ground, and is cultivated in the Bahamas and on the Florida Keys, often in very rocky soil. One of the very spiny-leaved species, *Bromelia Pinguin*, is widely utilized as a hedge plant in the West Indies. Other genera to be found here are: *Tillandsia* and *Vriesia*, in many species; *Guzmania*; *Aechmea*; *Pitcairnia*; *Hohenbergia*; *Cryptanthus*; and *Billbergia*.

In compartment *B* are those which require very humid and hot conditions for their successful cultivation; such a house is called an East Indian or stove house. Here the larger and more interesting of the genera represented are: *Catasetum*, of American distribution; *Dendrobium*, a large group of the Old World; *Coelogyne*, of large representation, also in the Old World; *Paphiopedilum*, the Venus-slipper, an Old World representative of the group containing our lady-slippers, *Cypripedium*; *Peristeria elata*, of Panama, the Holy Ghost or dove orchid; *Vanda*, widely distributed in the East Indies and Malay Archipelago, many of them with large and showy, often sweet-scented, flowers; *An-*

graecum, of tropical Africa and the Mascarene Islands; and *Phalaenopsis*, native in the East Indies and the Malay Archipelago. Other plants requiring the conditions here are the tropical or East Indian pitcher-plants, *Nepenthes*, a collection of which will be found here. They are mostly vines, growing naturally on trees, their leaves curiously modified at the ends into hollow structures, provided with lids, and technically known as pitchers, which are often wrongly regarded as the flowers; these pitchers contain water and secrete from their sides a liquid which digests insects that fall or crawl into the pitchers; this form of nutriment is apparently not necessary at all, however, to the growth of the plants; the flowers are small but borne in large clusters arising from the stems and may often be seen in this collection.

House No. 10. In this house is a large part of the collection of tropical ferns and their allies, and a part of the collection of cycads. The larger specimens of ferns and the tree-ferns will be found in houses 18 and 20, and the larger cycad plants in house 16. This house is the same size as No. 6.

In so far as cultural conditions will permit, the ferns and their allies are arranged in families and genera, thus expressing relationships. The arrangement begins on the east side, as one enters from the central display house, and continues on and around the house, terminating on the west side opposite the point of starting. Among the larger fern genera here represented are: the maiden-hair ferns, *Adiantum*; the polypodies, *Polypodium*, and a few related genera; the brakes, *Pteris*; the shield-ferns, *Polystichum* and *Dryopteris*; the spleenworts, *Asplenium*; and the Boston fern and its relatives, derived from *Nephrolepis exaltata*, a tropical species—an interesting group, showing the great diversity in forms which may result from a single species by selection and propagation. A large group, related to the ferns, is the selaginella family, represented by many species; this family is largely tropical, a

comparatively small number of species being found in temperate regions, a few of which are in North America. *Psilotum nudum* is another plant related to the ferns, and of rather rare occurrence in cultivation.

At the south end of the center bench is a part of the cycad collection. *Microcycas calocoma*, a rare Cuban plant, is among these. There are a number of specimens of the American genus *Zamia*, including representatives from Florida and the West Indies.

House No. 14. The plants in this house, which is the same size as No. 2, are natives of warm temperate regions, or of the greater altitudes in the tropics; they are not hardy in our climate. The larger specimens of the temperate collections will be found in the Central Display House.

The plants here are arranged in sequence of families as far as cultural conditions will permit, thus furnishing a collection for the comparative study of plant families and genera. The sequence begins on the right hand, as one enters from the Central Display House, and continues on and around this house, terminating on the west bench opposite the point of starting. First come the temperate ferns and their allies, and the members of the pine and yew families. Then follow the endogenous plants, those which are typified by the common lily, the grass, and the palm. Following these, and forming the greater part of the collection, are the exogenous plants, those with net-veined leaves. Two curious plants among the endogens are members of the lily-of-the-valley family; they are the butcher's broom (*Ruscus aculeatus*), and the double-tongue (*Ruscus Hypoglossum*). The iris family, to which belong the flags, is represented by an example from Bermuda, known as the Bermuda iris (*Sisyrinchium Bermudiana*); to this genus belong the blue-eyed grasses of the United States. The amaryllis family has as a representative a yellow star grass (*Hypoxis villosa*) from southern Africa, much resembling the species found wild in the eastern United States. A few specimens of *Paphiopedilum insigne* are

placed here, in order to show the relationship of the orchid family to the other endogenous ones. Curious among the exogenous plants is the horsetail knotweed (*Polygonum equisetiforme*), of southern Europe. Others of curious interest are the pitcher-plants (*Sarracenia*), of the south-eastern United States. The pitchers contain a liquid in which the insects are drowned, the fluid resulting through their decay being absorbed by the pitchers; these structures form a part of the leaves and are a modification of the petiole. The sundews (*Drosera*) are also insectivorous plants; they secrete a sticky substance from the glandular hairs on their leaves, which can digest insects and other animal matter. A plant useful as a ground cover in a temperate house is *Helxine Soleirolii*, a member of the nettle family. It grows rapidly and soon forms a beautiful carpet of green.

House No. 16. This house is about 28 feet wide and 43 feet long. Here is a collection of sago palms or cycads; others will be found on the south end of the center bench in house 10. This family of plants is represented by large specimens of *Cycas revoluta*, from Japan; *Cycas circinalis*, from the Molucca Islands; a single plant of the rare *Stangeria eriopus*, from southern Africa, where it is known as the kaffir's-head; the American genus, *Ceratozamia*, named on account of the horns on the scales of the cone—*Ceratozamia mexicana* and *Ceratozamia Miqueliana*, both from Mexico, are in the collection; a number of specimens of the genus *Zamia*, including the small Florida counties; the kaffir-bread (*Encephalartos*), from Africa; *Macrozamia Moorei*, from Australia; and the Mexican genus *Dioon*. The stems and trunks of plants of this family contain much starch, which is extracted, in the countries in which they grow, by crushing and washing, and passes into commerce under the name of sago starch. On the walls are specimens of aroid vines.

House No. 18. This house is about 68 feet long; it contains a part of the collection of tree-ferns, specimens of

other ferns too large for house 10, and the main collection of staghorn ferns, which are hanging from the roof. Specimens of aroid vines will also be found on the walls.

The graceful tree-ferns inhabit mostly the mountains of the tropics, commonly at an elevation of 1500 feet or more. Some of the plants have been secured by Garden expeditions to different parts of the American tropics. Suspended from the roof, in addition to the staghorn ferns, are other desirable ferns.

House No. 20. This is the same size as house 16. It contains tree-ferns, and large specimens of other ferns, including some of *Blechnum brasiliense*. Here is a fern from China and Tartary, known as the Scythian Lamb (*Cibotium Barometz*), which is of interest as forming the basis of a marvellous tale, current in early times, to the effect that on a vast plain to the eastward of the Volga occurred a wonderful plant, looking like a lamb. This animal, so the story ran, was supported upon a stalk and as soon as it had exhausted the vegetation at hand died from starvation. There are also climbing ferns in this house. Aroid vines will be found on the walls.

POWER HOUSES

Steam for heating conservatory range 1 is supplied from the power house, located near the New York Central Railroad just south of the 200th Street entrance and connected with the range by a subway about six hundred feet long containing the steam mains; five boilers are installed and supply steam not only to the range, but also to the museum building through another subway about twelve hundred feet in length.

Steam for heating conservatory range 2 is supplied from a boiler house near this structure, a little to the north.

4. The Mansion

This large stone house, situated on the high eastern bank of the Bronx River above the waterfall, came to the use

THE MANSION

VIEW IN THE PINETUM, THE MUSEUM BUILDING IN THE DISTANCE

of the Garden with the tract of about 140 acres added by the city to the reservation in 1915. At that time it was much out of repair, but considerable work has since been done upon it. The basement is used for shops for storage; the Bronx Society of Arts and Sciences has occupied a part of the building for several years, having museum collections on both the first and second floors as well as the use of a room for its Secretary; the Horticultural Society of New York has been given office room on the second floor; some of the laboratories of the Garden are located here; and part of the first floor has been fitted up for board rooms and a lecture room.

5. The Pinetum

[COLLECTION OF CONE-BEARING TREES]

The collection of cone-bearing trees, technically known as the Pinetum, because the pines are the most abundant of these trees, is planted over a space of about 30 acres in the southwestern part of the grounds, extending from the approach to the elevated railway station southeast to the herbaceous garden, and northeast to the museum building and the borders of the hemlock forest. The species of trees are grouped in genera, which are mostly separated by paths. The planting out of these trees was commenced in 1901; the collection will continually become more complete year by year as additional species are secured; many of these have to be raised from seed, and the process of establishing a collection of conifers thus requires much time.

Commencing at the approach to the elevated railway station we find the Douglas spruce (*Pseudotsuga mucronata*) planted in the space between the traffic road and the park driveway to the left of the path leading to the conservatories; this tree is a native of western North America from the Rocky Mountains to the Pacific Coast and is sometimes known as red fir; in the far northwest it sometimes becomes 180 to 210 feet high, its trunk occasionally as much as 14 feet in diameter, but in the Rocky Mountains it is

seldom one-half this size, and trees taken from the far northwest do not thrive well on the Atlantic coast, owing to the much greater rainfall which they naturally receive there; the cones of the Douglas spruce are from 2 to 4 inches long, pendant on the branches, their scales rounded and shorter than the bracts which project beyond them.

The hemlock spruces (*Tsuga*) are planted south of power house 1, and are represented by the Canadian hemlock spruce (*Tsuga canadensis*), the same species which forms the interesting forest on the hills bordering the Bronx River, and indicated on the general plan of the Garden as the hemlock grove. This tree occasionally becomes 100 feet high, with a trunk up to 4 feet in diameter, and is distributed throughout northeastern North America, extending southward along the mountains to Alabama, northward to Nova Scotia and westward to Minnesota. Its bark is the most important tanning substance in the United States and a great many trees are annually felled to obtain it; its wood furnishes a cheap lumber of little strength and durability. The weeping hemlock (*Tsuga canadensis pendula*) is one of the most beautiful dwarf evergreens. The Carolina hemlock (*Tsuga caroliniana*), from the mountains of southern Virginia to Georgia, may also be seen here, as well as Siebold's hemlock spruce (*Tsuga Tsuga*), to which the name *Tsuga* was first applied. The hairy-twiggled Japanese hemlock, *Tsuga diversifolia*, is also here.

In the area to the westward of the conservatories, extending to the west border, and bounded by paths on the north and south, are the firs (*Abies*). These can at once be distinguished from the spruces (*Picea*) by the erect, instead of pendulous, cones, and by the smooth branchlets. The wood of the firs is usually soft and not durable, so it makes poor lumber. Specimens of the balsam fir will be found here; this is widely distributed over northern North America, and from it is obtained Canada balsam or balm of fir, used in the arts and in medicine. The Japanese silver fir is an attractive plant, with its dark green stiff foliage.

Veitch's silver fir, from Japan, and said also to occur on the neighboring coast of Manchuria, is useful for ornamental purposes; it was discovered in 1860 on the famous Japanese mountain, Fuji-yama, by Mr. Veitch, for whom it is named. The red fir, from Washington and Oregon, with its blue leaves, borne almost erect and apparently on but one side of the branchlets, makes a conspicuous object; in its native country it sometimes attains a height of 250 feet but here is of very slow growth, as evidenced by the plants in the pinetum which are about 20 years old; its wood is sometimes used in the interior finishing of buildings. Among other firs here are: the white fir, from western North America, sometimes growing to a height of 200 to 250 feet; the Siberian fir, from northern Europe and Asia, yielding a soft lumber in general use and a bark used in tanning leather; the silver fir, from Europe; Nordmann's silver fir, from the Caucasus; the Cilician fir, from Asia Minor; and the Nikko silver fir, from Japan.

The spruces (*Picea*) are located in the area to the northeast of the firs. Some of the spruces are most valuable timber trees. The oriental spruce, from western Asia and the Caucasus, is present in several specimens. One of the hardiest spruces for our climate, and a general favorite, is the Colorado spruce, which sometimes becomes 100 feet tall in its native country; this will be found here in the green form; also in the varieties *glauca* and *Kosteri*, the blue color of the young leaves more marked in the latter, and a pendulous form of variety *glauca*. The Norway spruce and a number of horticultural forms are brought together to the west of the group of golden bells or Forsythia near the Garden station plaza; it is a commonly cultivated tree and furnishes a useful timber, which is known as "white deal" in England, and is largely used in the manufacture of musical instruments; the resinous exudation of this tree is known as Burgundy pitch, which, in combination with other ingredients, is used in Europe to line beer casks. Other spruces of interest here are the Yesso spruce, the

wood of which is much used in Japan; Engelmann's spruce, from western North America, the wood of which is largely manufactured into lumber and the bark sometimes used in tanning; the Servian spruce, one of the largest and most valuable timber trees of southeastern Europe; and the tiger-tail spruce, from Japan, introduced about forty years ago, one of the hardiest Asiatic species in cultivation.

The space allotted to the pines (*Pinus*) embraces the region to the eastward of the spruces and public conservatory, range 1, extending across the road to the herbaceous grounds. Most of the pines are of great economic importance, furnishing large quantities of lumber, turpentine and resin. Many of the white pines will be found on the westerly ridge of the herbaceous grounds and across the road from this to the eastward of range 1. Among these is our common white pine, which is perhaps the most valuable of the timber trees of northeastern North America, large quantities of lumber being derived from it. Near this is the Himalayan white pine, resembling it, but with longer drooping leaves and the cones borne on long stalks; this sometimes attains a height of 150 feet in its native country, where its lumber is much used for building and other purposes. In this region will also be found the white Swiss stone pine, of Europe and Asia; and the Macedonian white pine, of southeastern Europe.

In the area to the eastward of range 1 will be found, among others, the Austrian pine, with a hard, strong wood which is much used; the variegated Scotch pine, with the young leaves variegated; and a number of plants of the white pine, Himalayan white pine and the Rocky Mountain, western, and Korean white pines.

In the region to the north of the white pine tract, and on the westerly side of the herbaceous grounds ridge, will be found the Japanese red pine, and several horticultural forms of it. Following these to the north are a number of plants of the Jack or gray pine, native of northern North

America; its wood is sometimes used for fuel, and was valued by the Indians for the frames of canoes.

In the area to the eastward of the spruces are a number of other pines. The Korean white pine, a native of eastern Asia, is located next to the spruces. Near this is the Table-mountain pine. On the high ground to the eastward of the above is the Scotch pine, the principal timber pine of Europe and Asiatic Russia. On the easterly slope of this higher land and on the lower ground nearby may be found, among others, the red or Norway pine, from northeastern North America, the wood of which is largely used for building purposes and for masts, piles and spars; the small-flowered white pine, from Japan, where it is frequently used by the Japanese in producing their miniature trees; the Japanese black pine, useful for its wood; the Austrian pine, found native from Austria to the Balkan peninsula; and the yellow, or bull, pine, from western North America.

In the triangle located midway between the south gate and range 1, are the American cypresses (*Taxodium*), in two species: the bald cypress, and the pond cypress. These, like the larches (*Larix*), and a few other coniferous trees, shed their leaves for a portion of the year. They form vast areas in parts of the southern states, called cypress swamps. Their timber is of economic importance and their bark is rich in tannin. None of the true cypresses (*Cupressus*) are hardy with us.

At the northern end of the swale in which the herbaceous grounds are located, and to the westward of the morphologic garden, is the collection of larches (*Larix*) and also the members of the yew family (*Taxaceae*). The larches are deciduous trees, the wood of which is of great economic importance. Specimens of the European larch are here, and also of the Japanese larch. The genus *Pseudolarix*, distinguished from the larches in having the scales of the cones deciduous, is represented by its single species, the golden or Chinese larch; this, like the true larches, is a deciduous tree.

The yew family (Taxaceae) is represented by three genera. Of the true yews (*Taxus*) there are: the American yew, or ground hemlock; the English yew and several of its horticultural varieties, the wood of which was highly prized in ancient times for the manufacture of bows; and the Japanese yew. The last is by far the best for this climate, standing well the dry summers and cold winters; there is a dwarf form of this known as variety *nana*, which is an especially desirable evergreen for decorative planting. The cluster-flowered yew (*Cephalotaxus*) is represented by two from China and Japan. The Japanese Torreya (*Tumion nuciferum*) represents this genus. Another species, *Tumion taxifolium*, of Florida, is not hardy in our climate; it will be found in house 14, conservatory range 2. Still other representatives of the yew family are in the central display house and house 14 of conservatory range 2.

To the north of the economic garden will be found specimens of the umbrella pine, not a true pine, however, but belonging to the genus *Sciadopitys*, a native of Japan. Another tree here is the Japanese cedar, *Cryptomeria japonica*, with several horticultural varieties; this will stand our winter climate only in sheltered situations such as this; the variety *Lobbii* is more hardy and therefore better suited to this climate.

On the westerly corner of the conservatory terrace and in the immediate vicinity are located the retinisporas, which are so commonly cultivated as decorative plants. There are many horticultural forms here represented, but they are all variations of two Japanese trees: the Sawara cypress (*Chamaecyparis pisifera*); and the Hinoki cypress (*Chamaecyparis obtusa*). The latter species is frequently used by the Japanese in their dwarfing process. The names borne by the various horticultural forms have been suggested by some peculiarity in coloring or in manner of growth. North American species of the genus *Chamaecyparis* will be found in the low ground along the south walk, not far from the south gate.

On the easterly corner of the conservatory terrace, opposite the retinisporas, is a part of the juniper, or red cedar (*Juniperus*), collection. The remaining and larger portion of this collection will be found on the easterly end of the area lying between the driveway and the traffic-road south of range 1. In these two areas will be found many species and varieties of these plants. The common juniper, of north temperate regions, is one of these; also the Irish juniper, a form of this, of compact and strict habit. The red cedar, so common in a wild state in the grounds of the Garden, finds representatives in many horticultural forms. The savin juniper, of Europe and northern Asia, and its American representative, the Waukegan juniper, of northern North America, are both neat low-growing sorts. The Chinese juniper, and its striking form, of columnar habit, known as variety *pyramidalis*, are each present in a number of specimens. There are still other varieties of the Chinese juniper represented here, including *Pfitzeriana*, one of the best dwarf conifers.

At the westerly end of this area is the arbor vitae group (*Thuja*). The species of this genus produce a durable wood which is of especial value where there is contact with the soil. The Japanese arbor vitae is represented by several specimens. The common arbor vitae, from northeastern North America, is fully represented, not only by the typical form, but by many horticultural varieties, some of them very decorative; the wood of this tree is valued for fence posts, railway ties, etc., and from its young branches fluid extracts and tinctures are made which are used in medicine. The Chinese arbor vitae, from China and Japan, has a number of specimens representing it and some of its horticultural forms; this as a decorative plant in this vicinity is not satisfactory, as it is not quite hardy, the branches often killing back in the winter and the foliage burning badly.

The maiden-hair tree family (*Ginkgoaceae*) is represented by a single species, the maiden-hair tree, several specimens

of which may be found on the southern portion of the westerly ridge of the herbaceous grounds. This interesting tree, with its fan-shaped leaves, is a remarkable relic of a type of vegetation which was common and widely distributed in tertiary geologic time, but is now restricted to eastern temperate Asia in this one species, *Ginkgo biloba*.

PLANTATIONS OF YOUNG CONIFERS

The young white pine forest, established in the spring of 1916 on the rocky hill north of the iris garden, in cooperation with the State Conservation Commission through the interest of Dr. Walter B. James and the Honorable George D. Pratt, has continued to develop satisfactorily, and is of great interest as a demonstration of forest establishment. It has been carefully protected from fire by keeping the grass cut short in the autumn, and each young pine has been mulched with a small amount of leaf mold.

Through the further interest of the State Conservation Commission and of Dr. James, a new plantation of the red pine (*Pinus resinosa*) was made in the spring of 1918 on the rocky ridge opposite Fordham Hospital, nearly 2,000 four-year-old transplants being furnished by the Commission at a nominal cost. It happened that planting conditions were so good that nearly every pine grew, and this plantation has also been of exceptional interest.

A small plantation of the white fir (*Abies concolor*), a native of the west, has also been installed nearby, adjoining the beds of cannas in the horticultural collections.

The Victory Grove of 150 Douglas spruces (*Pseudotsuga mucronata*), also natives of western America, is located near the beds of gladioli in the same area. The trees were already about five feet high when planted in the spring of 1919 as war memorials.

6. The Deciduous Arboretum

This plantation extends over much of the garden area east of the Bronx River. The sequence of plant families

VIEW IN THE DECIDUOUS ARBORETUM

begins at the southeast corner of the grounds and continues northward to the northern boundary, occupying the easterly ridge and the low grounds adjacent thereto. Here hardy trees are brought together, trees being regarded as woody plants which have a single main stem arising from the ground and not branching until some distance above it. The groups will be referred to in the order of their sequence.

The first is the willow family which occupies the land south of the nursery, where a collection of willows and poplars may be found. Of these Simon's balsam poplar, native from the Amur valley to China, is of rapid growth and upright habit, and more graceful than the cottonwood or Carolina poplar; the American aspen, a native of northern North America, the wood of which is largely manufactured into pulp for the making of paper; in northern British America it is the principal fuel of the Indians, as it burns freely when green and without sparks; the inner bark, which is sweet, is often used by them as a food in early spring. This tree has been of great service in re-foresting large tracts which have been denuded by fire; the long hairy appendages to the seeds enable the wind to carry them far and wide, and as they germinate quickly and the young seedlings grow rapidly in exposed situations, it is admirably adapted to the above purpose, quickly furnishing a covering for the land until more desirable trees may get a foothold. The white or silver-leaf poplar, of Europe and Asia, and Bolle's poplar, a variety of this with lobed leaves and quite ornamental, are here. There also is the Lombardy, or Italian poplar, from Europe, with its tall spire-like growth. Among the willows are the white willow, from Europe and Asia, and the weeping willow, native of southeastern Europe and Asia, a tree commonly planted for ornamental purposes, and sometimes known as Napoleon's willow. An additional area to the south, east of the long lake, is now being developed for the willow family and the walnut family.

The walnuts and their relatives may be found in the region to the north of the willow family. The narrow-winged wing-nut, from China, is here. Of the walnuts (*Juglans*), the English Walnut, native from southeastern Europe to China, produces a most desirable nut, often called Madeira nut; the Romans introduced it into Italy, and from that place as a center its cultivation has spread in all directions, both in the Old World and the New; the nuts form a common article of food in southern Europe; in Europe and northern India an oil, called walnut-oil, used as a substitute for olive-oil, is obtained by subjecting the seed-leaves to pressure. The black walnut and the butternut are both wild elsewhere in the Garden, and are also represented here by small trees. The pecan-nut (*Hicoria Pecan*), wild in the southeastern United States, is another nut of popular favor, as is also the big shell-bark or king-nut, of the eastern United States. The water hickory, of the southeastern United States, and the bitter-nut or swamp hickory, of the eastern United States, are both represented, while the common shag-bark hickory and the pig-nut grow elsewhere in the grounds.

The birch family is located along the driveway, west and south of the stable, where birches, alders and hornbeams are planted; the European hornbeam is represented. The American hornbeam is common in Bronx Park, and the hop-hornbeam is occasional. Those desiring to study the birches (*Betula*) will find several species available; one of these is the yellow birch which grows wild in eastern North America, and is one of our most valuable timber trees; the wood, on account of its closeness of grain, strength and hardness, is suitable for many purposes. Another is the paper, or canoe, birch, of frequent occurrence in northern North America; the wood of this is preferred to that of any other tree for the manufacture of spools, and is also used in the manufacture of shoe-lasts and pegs; the Indians also make use of its wood in the manufacture of sledges, and from its tough bark they make canoes and baskets.

The river, or red, birch may be seen here; it is frequent along streams and lakes in the eastern parts of the United States; its wood is used in the manufacture of furniture. The black, or cherry, birch is in the collection, and this and the poplar-leaved birch are wild elsewhere in the Garden. There is also the European white birch and some of its varieties, the southern yellow birch, and others. The alders are present in several species: the dye alder, of Japan, which becomes a large tree; the Japanese alder, also of Japan; the speckled or hoary alder, of north temperate regions; and the European alder.

The area devoted to the beech family lies to the westward of that assigned to the birch family; the oaks, the chestnuts and the beeches belong here. The oaks (*Quercus*) are represented by many species. One of these is the rock chestnut oak, of the northeastern United States; its wood is strong and durable, especially when in contact with the soil, and is therefore of great value for railroad ties and fence posts, and its bark is largely used for tanning. The mossy-cup or bur oak, of eastern North America, may be found here; this was discovered by the botanist Michaux in 1795, and is a valuable timber tree, its wood largely used for boat-building, for the manufacture of carriages and agricultural implements, for the interior finish of houses, and, on account of its durability in contact with the soil, for railroad ties. The red oak and the swamp white oak are natives of eastern North America; the latter is also a good timber tree, its wood being used for cabinet work and in various kinds of construction. The saw-toothed oak forms a part of this collection; its leaves are much like those of the chestnut, and might easily be mistaken for them; it is often planted in Japan in the silk districts, as its leaves are available as food for the silkworms; the Japanese make charcoal from its wood, and from the bark they extract a black dye. The post, or iron, oak is a native of the eastern United States. Here may be seen also the English oak, a native of Europe and western

Asia. The large-toothed oak, of Japan, a valued timber tree there, is represented nearby; as is also the gland-bearing oak, another Japanese species. The shingle, or laurel oak, of the eastern United States, is not of much commercial value, as its wood checks badly in drying; it is sometimes used in making clapboards and shingles. Schneck's oak comes from the south central parts of the United States. The Turkey oak, of southeastern Europe and western Asia, is valued in that region on account of its bark which is used in tanning leather. Several hybrid oaks form interesting parts of the collection. The pin oak, the scarlet oak, the black oak and the white oak are to be seen in large wild specimens elsewhere in the grounds.

The chestnuts (*Castanea*) are represented by the Japanese chestnut, of China and Japan. The American chestnut was in former years common about the grounds, some of the trees being large and of great age. The chestnut blight has destroyed or necessitated the destruction of all of these trees. The beeches (*Fagus*) are located in the north part of the swale at the west side of the oak family reservation. The European beech and its purple-leaved variety may both be found here in small, recently planted trees; there are large specimens of the purple-leaved and weeping varieties of this south of the mansion. Small trees of the American beech are also here, but large wild specimens may be found along the driveways and paths in the vicinity; the wood of the beech takes a high polish and is largely used for furniture, while the nuts are edible. The uses of the European beech are about the same as those of the American.

The elm family, to which belong the elms, the hackberries or sugarberries, and the water-elms, is located on the ridge to the north of the stable. Among the elms (*Ulmus*) to be found here is the Scotch or Wych elm, native from Europe to Japan; the red elm, growing wild from Tennessee to Alabama; the cork or rock elm, of northeastern North America; the Chinese elm, of China and Japan; and the

winged elm or wahoo, of the southeastern United States. The American elm and the slippery elm are wild in the grounds. The hackberries (*Celtis*) represented are the Georgia hackberry, the dog hackberry, and Small's hackberry, of the southeastern United States; and the nettle-tree, or sugarberry, of eastern North America. The water-elms are illustrated by the sharp-pointed water-elm, or *Zelkova*, a native of Japan. The mulberry family (Moraceae) is represented by the osage orange (*Toxylon*), a native of the south central parts of the United States, trees of which may be found to the south of the driveway from the long bridge; and by the Russian red and white mulberries. The kadsura tree family has for its representatives the kadsura tree, of Japan, and the elm-leaved eucommia, of China, located just to the south of the row of large tulip trees east of the Bronx River.

The magnolia collection is planted on the west and south sides of the swale between the two ridges. The long-leaved umbrella tree is one of those to be seen here; it is a native of the mountain woods from Virginia to Florida and Mississippi. The cucumber tree, the white-leaved Japanese magnolia, the umbrella tree, and a number of hybrid forms are other magnolias to be looked for here. Large specimens of the umbrella tree and of the large-leaved umbrella tree will be found at the north end of the herbaceous grounds, on the west side; and still other species at the fruticetum. The tulip-tree is shown by a row of fine wild specimens just to the south of the long bridge over the Bronx River, the largest trees within the grounds of the Garden. This tree is native of the eastern United States and yields a valuable lumber known as yellow poplar or white-wood; the Indians formerly made their canoes from this wood. Four parallel rows of this tree form part of the approach to the museum building. Related to the magnolias is the custard-apple family, represented by two specimens of the North American papaw, which will be found at the herbaceous grounds on the west side, near

the north end; this is a native of the eastern part of the country, from Ontario and New York to Michigan, Nebraska, Florida and Texas. Other tropical representatives of this family will be found in house 2, conservatory range 1. The laurel family is represented by the sassafras, many trees of which may be found wild in various parts of the Garden. The sweet gum (*Liquidambar*), also wild in the grounds, represents the witch-hazel family.

The plane-trees are to be found just to the west of the elms. Here are specimens of the American plane-tree; it is a native of the eastern United States. On a knoll nearby is a large specimen, native to the grounds, of this tree, which is also known as the button-wood and button-ball, and there are many other wild trees along the Bronx River. Specimens of the London plane will also be found here. This is largely planted as a shade tree in Europe, and is often used in this country for the same purpose. It is commonly known and sold as the oriental plane, but it is not that tree, but a hybrid of horticultural origin. The wood of the American plane, or button-wood, is largely used in the manufacture of boxes for tobacco, for furniture, and for the interior finishing of houses.

The apple family and the peach family are located to the north of the driveway leading to the long bridge. In the apple family may be found some of the tree hawthorns and thorns, including the Washington thorn, a native of the southeastern United States. Following to the west are some of the true apples (*Malus*), among them the Siberian crab-apple, a native of eastern Asia; the cherry-leaved crab-apple, presumably a natural hybrid, originally from Siberia; the American crab-apple, from the eastern United States; and Soulard's crab-apple, from the central United States. In the peach family, among others, may be found the rose-bud cherry, a Japanese plant, and a highly decorative species; and the ordinary sweet cherry, originally from Europe, a delicious fruit, of which there are many horticultural forms.

Along the path in the little swale running to the west is a collection of the Japanese flowering cherries which are so highly admired by the Japanese, and this admiration is shared by all who see these specimens at the height of their loveliness which comes about the last week in April or the first in May. There are about one hundred trees in the collection, the blossoms from single to double, and the colors ranging from white to the deepest rose, and one with the blossoms a yellowish green, quite in contrast with the remainder. There is also in this collection a group, occupying the point dividing the paths, of the Japanese weeping cherry; this blossoms two or three weeks earlier than the others; its long drooping branches, clothed with delicate pink blossoms, make of it a graceful and charming object.

Near the eastern end of the long bridge are trees illustrating the senna family, located south of the bridge approach, and the pea family, the rue family and the mahogany family on the north side. One of those in the senna family is the honey-locust or three-horned acacia (*Gleditsia*), a native of eastern North America; its durability when in contact with the ground makes its wood of especial value for fence posts, for which purpose it is largely used. Another of this family is the Kentucky coffee-tree, in several large and small specimens. One of the representatives of the pea family, from Japan, is the Japanese yellow-wood (*Maackia*). Another is the locust-tree (*Robinia*), a native of the south central United States, but extensively naturalized elsewhere; its wood is hard and close-grained, and is very durable when in contact with ground or with water, so the high value in which it is held for fence posts and for ship-building may be readily understood. The rue family has for representatives the Japanese cork-tree (*Phellodendron*), from central Japan, and the Asiatic or Sachalin cork-tree, from northeastern Asia. The mahogany-tree family has a single species represented, the Chinese bastard-cedar, a native of northern China; the mahogany tree itself, and other representatives of the family, will be found at conservatory range 1.

On the ridge to the northeast of the apple family, and to the west of conservatory range 2, are trees of the ailanthus family, represented by the *Ailanthus*, or tree-of-heaven, a native of China, but extensively naturalized in the eastern parts of the United States, where in some places it has become a nuisance, both on account of its ill-smelling staminate flowers and its habit of freely suckering from the roots.

On the ridge to the west of conservatory range 2 are representatives of the maple family. The maples (*Acer*) are represented by a number of species. Perhaps the most important of these is the sugar, or rock maple, a native of eastern North America, and the principal tree yielding maple sugar and syrup. The sap is usually collected from late in February to early in April; trees from twenty to thirty years old are considered the most productive, and a tree will usually yield in a season from four to six pounds of sugar, some giving less and others much more. This tree is often planted for shade along streets and in parks, its beautiful coloring in the fall enhancing its value for this purpose. Its wood is largely used for making furniture, in ship-building, for tool-handles and for shoe lasts and pegs. From the southeastern United States comes the white-barked sugar maple, also in the collection. Another tree here is the red maple, ranging throughout eastern North America; its wood is now used in large quantities for the manufacture of furniture of various kinds, for gun-stocks, etc. The striped, or goose-foot, maple, sometimes known also as moosewood, of eastern North America, is a pretty, decorative species, especially attractive on account of the beautiful marking of its bark. The box-elder, or ash-leaved maple, native of eastern North America, represents another type with compound leaves. Three Old World representatives are the common European maple, of Europe and western Asia; the sycamore maple, from Europe and the Caucasus; and the Norway maple, with a number of varieties, also from Europe and the Caucasus.

The sycamore maple is a valuable timber tree in Europe; its wood is used in the manufacture of musical instruments, spoons and other household utensils. Other maples are at the fruticetum. Farther north on this ridge may be seen young trees of *Koelreuteria*, the varnish tree, native of China, Korea, and Japan.

In the buckeye family, planted north of conservatory range 2, is the common horse-chestnut (*Aesculus*); for a long time the native country of this tree was unknown, and its home was ascribed by different authors to various lands; it has been pretty well established now that it is indigenous to the mountains of northern Greece and Bulgaria. Another tree here is the fetid or Ohio buckeye, of the south central United States; its wood, as well as that of some of the other kinds of buckeye, is manufactured into artificial limbs, for which purpose it is highly esteemed; it is also used for wooden-ware and paper pulp. To the north of the buckeye family is the linden family. The American linden or basswood, found over the eastern parts of North America, is here; it produces a large amount of lumber under the name of whitewood, which is used in the manufacture of wooden-ware, furniture, and carriage bodies; it is also largely used in the manufacture of paper pulp. Other species are the white or silver linden, of eastern Europe and Asia Minor, and the common European lindens.

Next in the sequence comes the oleaster family, represented by the oleaster, a native of southeastern Europe and western Asia. Then follows the ginseng family, represented by several species of aralia, while others will be found at the fruticetum; many other species of this family may be found at the conservatories. West of these is the ebony family, represented by the persimmon or date-plum (*Diospyros*), a native of the southeastern United States; its wood is preferred for the manufacture of shuttles; its fruit contains tannin, which gives it its astringent properties; this fruit, when fully ripe, is eaten in large

quantities in the southern states, and is also offered for sale in the markets of the north. Larger trees will be found along the driveway east of the museum.

Farther down the hill, west of the persimmon group, is a collection of the flowering dogwood, *Cynoxylon floridum*, both the form with white flower bracts and that with red; the former being common in the woodlands. Another representative of the dogwood family is the sour gum (*Nyssa*), of eastern North America; it occurs wild in the Garden in many fine specimens.

Beyond the ginseng family, on the western slope of the hill, is the olive family, represented by many species of the ash (*Fraxinus*), some of which are useful for timber. The common European ash is to be seen, and among the North American representatives are the green ash; the Texas ash, restricted to that state; the Biltmore ash, from Pennsylvania to Georgia; the white ash, and the red ash are common. Following to the north is the figwort family, represented by *Paulownia*, a native of Central China. Terminating the sequence is the trumpet-creeper family, represented by species of *Catalpa*; among these is the Indian bean, a native of woods in the Gulf States, and Kaempfer's catalpa, from China.

SALICETUM

The area occupied by the willow plantation is between the main driveway and the Bronx River, north of the fruticetum, and comprises several acres. Here are brought together moisture-loving willows (*Salix*) and poplars (*Populus*) as a collection apart, many species grown here not being represented in the arboretum and fruticetum. In the corner of the salicetum, next to the driveway, is a group of willows, consisting, in part, of the red-stemmed willow, of horticultural origin, and the slender purple willow. To the east of this may be found the golden or yellow willow, of common occurrence in eastern North America, but a native of Europe and Asia, and the Bashford

willow, a native of France. Along the west bank of the Bronx River may be found the Eugene poplar, of horticultural origin; and a row of the weeping willow, a native of southeastern Europe and Asia. At the northern end of the area devoted to this plantation are to be found, among others, the purple willow, a native of Europe, Northern Africa, and Asia; and the black willow, of eastern North America. Many other species are represented in this collection.

7. The Fruticetum

[COLLECTION OF SHRUBS]

This plantation, occupying about 16 acres, is located to the northward of the lakes in the rear of the museum building, and is confined to the area lying between the lakes, the railroad, the woodland on the east, and the north meadows. In this collection are brought together specimens of hardy woody plants which are shrubs, that is, plants with woody stems which branch from the ground and have no single main stem. The arrangement here parallels that in the herbaceous grounds and in the other systematic collections. The sequence begins on the southerly side near the long stone bridge which crosses the Bronx River, and proceeds on both sides of the path running to the north along the edge of the woods, returning southward on both sides of the path paralleling the main north and south driveway, to the peach family, on the bank overlooking the water garden. It then crosses to the senna family directly opposite and overlooking the westerly lake, proceeding northward from there across the transverse driveway, and following the line of the path paralleling to the westward the main north and south driveway. The sequence then continues to the westward along the north path, again extending southward at the Woodlawn Road entrance, continuing on both sides of the westerly path and terminating with the thistle family at the westerly end of the lake near the railroad border. The families will be

referred to below in this sequence. Woody vines are grown at the viticetum.

The pine family, represented among others by low-growing junipers and pines, begins the sequence to the southward of the approach to the long bridge. The next is the willow family, beginning across the road from the pine family; this group is located on both sides of the path and comprises many forms from various parts of the world; the family is largely an inhabitant of temperate regions, so many species can be grown here. The bayberry family occurs across the driveway from the willows, occupying a position on the bank overlooking the water garden. Here may be found the sweet-fern, a native of eastern North America; the sweet gale, at home in north temperate regions; and the waxberry or bayberry, common in northeastern North America; the berries of the latter have a covering of wax, which is separated by throwing the berries into hot water, when the wax melts and rises to the surface, where it is skimmed off; it is still used to some extent in making candles. The monotypic corkwood family is represented by the corkwood (*Leitneria*) of the southern United States, which has proven to be hardy here at the foot of the terrace, its catkins flowering early in the spring. The birch family follows the willows on the east side of the path; here are the hazel-nuts, the alders and the shrubby birches; the common hazel-nut, of eastern North America, and the beaked hazel-nut, from northern North America, also the common hazel-nut or filbert of Europe, and others; the smooth alder, common along streams and in swamps, in the eastern United States, is also here. Following the birch family on the same side of the path comes the beech family; here may be found the shrubby oaks, and the chinquapin of the southeastern United States. On the same side of the path, a little farther along, is the elm family, represented by the dwarf elms; most of the members of this family are trees and may therefore be found in the aboretum. Immediately following this is the

VIEW IN THE FRUTICETUM, OR SHRUB COLLECTION

WOODLAWN ROAD ENTRANCE, FRUTICETUM

mulberry family, represented here by specimens of the Russian mulberry.

The crowfoot family occupies a space just to the north of the willows west of the path, and is represented by the moutan or tree peony, from China, and the shrub yellow-root (*Xanthorrhiza*), from the southeastern United States; its roots are yellow, and at one time were employed as a dye; there are many herbaceous members of this family at the herbaceous grounds. The barberry family is a little farther north on the same side of the path; many species of barberries and mahonias occur here. Among the barberries may be mentioned: the common barberry, native from Europe to eastern Asia, the ripe fruit of which is sometimes made into preserves; and the unripe ones pickled as a substitute for capers—its bark is used as a dye and for tanning leather; Thunberg's barberry, from Japan, a desirable plant for small hedges and for the borders of walks; the neat barberry, from the Himalayan region, which colors a beautiful red in the fall; and the spine-toothed barberry, from the Himalayan region; the mahonias are represented by the Oregon grape, from northwestern North America; and the Japanese mahonia, distributed from the Himalayan region to China and Japan. The magnolia family occurs a little back from the path, between the crowfoot and barberry families; there are here several species of shrubby magnolias, and others will be found at the deciduous arboretum. The strawberry-shrub family is located on the point dividing the paths, opposite the mulberries already referred to; here may be found several species of the strawberry-shrub, and the oriental sweet-shrub, from China and Japan. A short distance to the north of the strawberry-shrub family is the laurel family, represented by the spice-bush (*Benzoin*), a native of northeastern North America; as the different kinds of flowers, staminate and pistillate, are borne on different plants, only those having pistillate flowers bear the bright red berries in the summer and autumn. In

the lower land below, to the east of the path, is the Virginia willow family, with shrubs of the Virginia willow, a native of the southeastern United States. Across the path from this is the hydrangea family; here may be found the syringas (*Philadelphus*), the deutzias and the hydrangeas, several species of each; the mock orange (*Philadelphus coronarius*), a native of the Caucasus, Armenia, and Europe, indicates its presence by the rich fragrance of its flowers; the slender deutzia, from Japan, bears its long slender clusters of white flowers in great profusion; the lawn hydrangea bears a profusion of large bunches of white flowers, which in the late summer and autumn change to a beautiful rose color; the oak-leaved hydrangea is perhaps the oddest member of this genus and is a native from Georgia and Florida to Mississippi. Following the hydrangea family comes the gooseberry family, and to this belong the currants and gooseberries; one of the showiest is the golden currant, native from South Dakota to Texas, its rich yellow flowers giving forth a delicious spicy fragrance. The witch-hazel family is located to the north of the north path and on the point opposite; here is the witch-hazel, of eastern North America, from which the extract of witch-hazel, or Pond's extract, is made, the Japanese witch-hazel, and also a Chinese representative of this genus; the common corylopsis, a Japanese shrub, belongs here, as do the fothergillas of the southeastern United States.

The rose family occupies a large area, beginning just north of the gooseberries and currants and extending westward to the main north and south driveway, and southward along that as far as the first transverse path; here belong the spiraeas, of which there are many forms, the blackberries, the raspberries, the roses and others. Among the spiraeas, the steeple-bush or hard-hack and the hairy meadow-sweet are common as wild plants in this latitude. Other interesting forms are Thunberg's spiraea, from Japan, one of the earliest to flower, and other Japanese spiraeas. Among other plants of interest in the group

which contains the spiraeas are the Chinese pearl-bush, a native of China, with its profusion of white flowers in early summer; the Japanese rose (*Kerria*), from Japan, not a true rose, however, with bright yellow flowers; another shrub from Japan, the white Japanese rose (*Rhodotypos*), bears large white flowers resembling in appearance those of the mock orange; two other Japanese shrubs, the common and the large-leaved stephanandra, are exceptionally graceful and attractive plants; *Neviusia*, an extremely local plant, known in a wild state only in Alabama; and the nine-barks (*Opulaster*). To the southward of the spiraea group comes the collection of blackberries and raspberries (*Rubus*) represented by many kinds; two of the showiest are the wineberry and the thimble berry (*Rubacer*), the latter common in rocky woods in this part of the country. Farther to the south is the group of the true roses; many kinds may be found here, including the sweet-brier, the dog-rose or wild-brier, and the red-leaved rose, all natives of Europe; the pasture rose of the eastern United States; and the odd-looking Watson's rose, a native of Japan. Numerous herbaceous species of the rose family are grown at the herbaceous grounds.

Following this is the apple family; to this belong the apples and pears, many of which, being trees, may be found in the arboretum. Of a shrubby habit, and therefore members of this collection, are many of the hawthorns or thorn-apples, the quinces, the cotoneasters, the choke-berries, the service-berry and the shad-bush. Southward across the driveway from these, and overlooking the easterly lake, is the collection illustrating the peach family, to which belong the plums, cherries, apricots and peaches. As many of the species of this family are trees they may be found at the arboretum. Among those represented here are the western sand-cherry, of the central United States; the double-flowered plum and the dwarf cherry, from Europe.

Crossing the driveway to the west, the sequence is again taken up on the ground overlooking the west lake, with the

senna family, represented by the Asiatic red-bud, of China and Japan, and the American Judas-tree of the eastern United States; in spring, before the appearance of the leaves, these are profusely covered with pink or purplish flowers. Across the transverse driveway to the north, and directly on the opposite side, may be found the pea family. Here are various species of the pea-tree: the pigmy pea-tree, ranging from the Caucasus to Siberia and Thibet; the Chamlagu pea-tree, from northern China; the Chinese pea-tree; and the small-leaved pea-tree. The Scotch broom and the dense-flowered broom, of Europe, have representatives here; of these, the former, in Spain and France attains the size of a small tree, and its wood is highly prized for veneering and cabinet work; its branches are extensively employed for making brooms, whence its common name. Other plants of interest are the false indigo, the rose acacia, and Kelsey's rose acacia, all from the Southeastern United States; the tall bladder-senna, from southern Europe and northern Africa; and the scorpion senna, from southern Europe. Immediately beyond is the rue family, illustrated by the hop tree (*Ptelea trifoliata*) of the eastern United States; the prickly ash, from the northeastern United States, Bunge's prickly ash, from China, and the Japanese prickly ash from Japan and Korea; the trifoliolate orange, from northern China, which has been used as one of the parents in the recent hybridization experiments by the U. S. Department of Agriculture in its effort to produce a more hardy orange; the lemon and forms of the orange may be found in conservatory range 2, together with other woody members of this family. Following this is the box family, represented by a number of forms of the box-tree, from Europe, Asia and Japan; the wood of the box-tree is highly prized for wood-engraving, on account of its hardness and close fine grain, and it takes a fine polish. A few steps farther on is the sumac family, to which belongs the common poison ivy, so frequent in and around

New York City; here are the fragrant sumac, the mountain sumac, and the smooth, or scarlet, sumac, all from the eastern United States; Osbeck's sumac is a stately shrub from China. The European and the American smoke-trees (*Cotinus*) are relatives of the sumacs; the former is sometimes called the wig-tree, on account of the flower-clusters, which become white and feathery in fruit; a dye is obtained from it which is called young fustic.

Crossing the transverse path to the triangle, the holly family is on the nearest point, shown by Siebold's holly and the Japanese holly, both from Japan, and the American holly; the European holly is grown in conservatory range 2. The Virginia winter-berry, of the eastern United States, bears its bright red berries far into the winter. On the opposite corner of the triangle is the staff-tree family, illustrated by many forms of *Euonymus*; the European spindle tree, the burning-bush of eastern North America, the winged spindle-tree of China and Japan, and Bunge's spindle-tree of the Amur region are shown. Crossing the path to the north of the triangle we come to the maple family; most of the maples are trees, so they must be looked for in the arboretum, but here are specimens of the Ginnala maple, from Manchuria, northern China, and Japan. Immediately beyond this is the bladder-nut family, represented by species of the bladder-nut (*Staphylea*), both from the New and the Old World. Following the path to the west, we come to the buckeye family, represented here by the small-flowered buckeye, from the southeastern United States; many of the buckeyes and horse-chestnuts are trees, and are grown in the arboretum. Following this is the soapberry family, with the genus *Xanthoceras*, a native of northern China, as a representative. At some distance from the path to the left is the buckthorn family; the most familiar plant here is the New Jersey tea or red root, of eastern North America; its leaves were formerly used as a substitute for tea; the jujube, an inhabitant of the Mediterranean region and temperate Asia,

is of this family, its edible fruit oval in shape and about the size of a plum, with an acid taste when fresh; the Dahurian buckthorn, growing wild from central Asia to the Amur region, and the purging buckthorn of Europe and western and northern Asia, the berries of which are medicinal, are here; from the juice of the ripe fresh berries of the purging buckthorn, mixed with alum, is made the pigment, known as sap-green or bladder green, used by water-color artists. Close to this is the linden family, represented by the genus *Grewia*. The mallow family, further along the path, is represented by specimens of the rose-of-Sharon (*Hibiscus syriacus*), from Asia, and often found escaped from cultivation in the eastern United States; many herbaceous representatives of this family may be found at the herbaceous grounds. Near the mallow family is the tea family, represented by the mountain *Stewartia*, from the southeastern United States; other members of the tea family, including the tea plant and the common camellia, may be found in conservatory range 2. Also near the mallows may be found the St. John's-wort shrubs (*Hypericum*), with their showy yellow flowers. Farther on, where the path bends to the left, is the tamarix family, represented by several species of tamarix, Old World plants. Next comes the mezereon family, having as a representative the leather-wood or moose-wood (*Dirca*), of the eastern parts of North America; the name leather-wood refers to the very tough inner bark; the bark is a violent emetic; the daphnes are of this family, and here will be found the garland-flower, the spurge flax, and the Chinese daphne.

Some distance from the path and opposite the Woodlawn Road entrance, is the oleaster family, including several species of oleaster, the buffalo berry, and the sea-buckthorn, a native of Europe and Asia, the berries of which are acrid and poisonous; the berries of several of the species of oleaster are edible; the buffalo berry, of central North America, is largely eaten by the Indians of that region; the berries

of the oriental oleaster, known as Trebizond dates, are made into cakes by the Arabs, after having been dried. Plants of the ginseng family form a group opposite the same entrance, some of these being quite tropical in aspect; the Chinese angelica-tree, from China and Japan, is one of these, and another is Maximowicz's *acanthopanax*, from Japan; the variegated Chinese angelica-tree is quite ornamental. Beyond this group, and on both sides of the transverse path, is the dogwood family, shown by many species of dogwood or cornel (*Cornus*), from both the Old World and the New; the red-osier dogwood, the kinnikinnik and the panicle dogwood are American representatives; the officinal dogwood comes from Japan and China and is known in Japan as *sandzaki*; the dogberry, gater-tree, or hound's-tree, is from Europe and the Orient; its wood is hard and is sometimes made into butchers' skewers and tooth-picks; in France, an oil used for burning and in soap-making is extracted from the black berries. *Benthamia japonica*, the Japanese flowering dogwood, from China and Japan, is shown in a number of specimens; this is related to our native flowering dogwood, *Cynoxylon floridum*, which will be found in the deciduous arboretum.

Across the path from the dogwoods, at the foot of the steps, may be found the white-alder family. Here are the Asiatic sweet-pepper bush and the North American sweet-pepper bushes or white-alders, their fragrant white flowers appearing in August. The heath family is next, represented by many forms of azaleas and rhododendrons; the Japanese *Pieris* is a pretty plant, and another, from the southeastern United States, is called mountain fetter-bush; the stagger-bush, of the southeastern United States, is also here. Following the path to the south, we come next to the huckleberries and to the shrubs of the storax family. On the other side of the path is the olive family, which covers a large area, extending along the path for a considerable distance; the olive-tree is the type of this family, and specimens may be found at conservatory range

2; in the fruticetum are several forms of the golden-bell (*Forsythia*), mainly from China; a number of the privets, including the California privet, so much used for hedges; a variety of lilacs (*Syringa*), including the Rouen lilac, hairy Chinese lilac, the Pekin lilac, from northern China, the Himalayan lilac and the common lilac, a native from southeastern Europe to the Caucasus, so frequently cultivated in gardens, and the genus *Forestiera*. To the right of the path and following the storax family is the logania family, with species of *Buddleia*, including the summer lilac, from China. Following this is the vervain family, and some of these shrubs are especially attractive in fruit, among them being the Chinese callicarpa, and the Japanese callicarpa; most attractive is the late-flowering clero-dendron, known as kusagi in Japan, where it is native; its flowers have a delicious spicy fragrance, much like that of the sweet-pepper bush; the sepals are a beautiful rose color, while the corolla is creamy white; it blooms late in the summer or early fall, when flowers of shrubs are few.

We next come to the potato family, shown here by the matrimony vine, a native from China to southeastern Europe, but often found growing wild, its purple flowers followed by bright red berries; most of the hardy representatives of this family are herbs, so must be sought for in the herbaceous grounds, while many of the woody species, and some of the herbs, are tender, and may be found in house 2 at conservatory range 1. The figwort family is shown in a single representative from the northwestern United States, *Pentstemon Scouleri*; many other representatives of this family are in the herbaceous grounds and in house 2 at conservatory range 1. The succeeding group is the honeysuckle family, to which is allotted a large area, there being many hardy kinds; the viburnums are represented by many species, both from the Old World and the New, such as the European cranberry-tree, from Europe, Northern Africa, and Western Asia, ornamental by its masses of bright red fruit; the dwarf cranberry-tree, an

exceedingly compact form, very dense in its growth; Thunberg's viburnum, from China and Japan; Siebold's viburnum, from Japan; the Japanese snowball, from China and Japan; the wayfaring tree, from Europe and western Asia; and the woolly viburnum, from China and Japan; among American forms may be mentioned the veiny arrow-wood, the black haw or sloe, the withe-rod, and the larger withe-rod with its large bunches of showy fruit. The group of the honeysuckles occupies a position across the path from the viburnums, and here may be found, among others, the fragrant honeysuckle, from China, one of the first to send forth its blossoms richly laden with perfume; Morrow's honeysuckle, from Japan, covered with coral-red fruit in late summer and fall; Standish's honeysuckle, from China; Albert's honeysuckle, from Turkestan; the Turkestan fly-honeysuckle; and the golden-veined honeysuckle, from China and Japan, with the veins richly marked with yellow, or sometimes the whole leaf yellow. Across the transverse path to the south, and overlooking the lake, may be found the weigelas, symphoricarpos and the diervillas; the weigelas are illustrated by many showy forms, flowering in early summer; the showiest *Symphoricarpos* is the smooth snowberry, native of northern North America, laden in autumn with its ivory-white fruit, making it most attractive; the diervillas are represented by two or three species, including the bush honeysuckle, a native of northeastern North America. The elder-berries (*Sambucus*) are also represented by two or three species. The hybrid abelia will also be found here; its fragrant flowers are borne in great profusion during late summer and early fall; the sepals are deep red-brown and the corolla is white, flushed with rose, making a pleasing combination.

Following the viburnums comes the thistle family. Few of the woody species of this family are hardy in this latitude, but large numbers of the herbaceous species may be found at the herbaceous grounds. As representatives in

the fruticetum, we have the groundsel-bush or pencil-tree (*Baccharis*), a native of the southeastern United States, bearing in the fall a profusion of white fruit, making it a most attractive object.

VITICETUM

The area devoted to the plantation of hardy vines is above the easterly side of the economic garden, where a rough arbor has been constructed for them to climb upon. The arrangement begins at the southerly end of the arbor, on the left hand side, with the smilax family, to which belong the green-briers or cat-briers, and the yam family is placed immediately opposite to the right. The birthwort family, with the dutchman's-pipe as a representative, follows the smilax family on the left. On the left hand side, and beyond the birthwort family, is the akebia family, where one may find the five-leaved akebia, a native of Japan. Following this on the same side is the moonseed family, to which belongs the Canada moonseed. On the opposite side of the arbor is the hydrangea family. Following this, also on both sides of the arbor, is the pea family, including species of the peas and wistarias. Further on, occupying both sides, is the staff-tree family, where may be found the climbing bitter-sweet and other vines of this family. Succeeding this comes the grape family, to which belong the grapes, the Virginia creeper and the Japanese ivy. Beyond the grape family, is the actinidia family, represented by the sharp-toothed actinidia. Then comes the trumpet-creeper family, of which the trumpet-creeper, a native of the southeastern United States, is a member. This family in turn is followed by the honeysuckle family, represented here by several species of honeysuckle and woodbine.

8. The Herbaceous Garden

The systematic collection of hardy herbaceous plants is situated in a valley southeast of conservatory range 1, and between the main driveway and the western border of

VIEW IN THE HERBACEOUS GARDEN

the woods fringing the hemlock grove. This valley is about 1,500 feet long and averages about 300 feet wide. A small stream runs through it from north to south and is here and there broadened out into pools. The plants are arranged in beds according to their natural botanical families. At the southern end are the seedless plants, represented by the ferns and their allies; east of the brook are the families of seed-bearing plants belonging to the large endogenous division, or those with parallel-veined leaves and with one seed-leaf (monocotyledons). To the west of the brook are the families belonging to the exogenous division of plants, or those in which the leaves are usually net-veined and which have two seed-leaves (dicotyledons); this latter group embraces the larger part of the plants in the collection. Along the brook, or in it, may be found many aquatic plants, representing in some cases families which are exclusively water-lovers, while in other cases they are aquatic representatives of families occurring in the immediate vicinity in the beds. In this plantation, the family groups are arranged substantially in a sequence beginning with those of simpler organization and proceeding to the most complex.

The series commences in the southern corner of the valley at the foot-path entrance, where the hardy ferns and their allies may be found, including species from many parts of the north temperate zone. Among these may be mentioned the ostrich fern, the cinnamon fern, Clayton's fern, the royal fern, the brake or bracken, and a number of species of the shield-ferns and of the spleenworts. Some of the aquatic representatives of the ferns and their allies may be found in the pond nearby.

In this pond may also be found the following aquatic endogenous families: the cat-tail family, the bur-reed family, the pond-weed family, and the tape-grass family. At the junction of the brook with this pond is the water-plantain family, including, besides the water-plantain, several species of arrow-head (*Sagittaria*). A little be-

yond, in the brook, may be found the water-poppy family, represented by the water-poppy, a showy plant common in tropical regions; this is not hardy and must be removed to a warm place for the winter; it will also be found at all times at conservatory range 1, house 9.

Following to the north comes the large group of the grasses and grass-like plants, those whose flowers, mostly very small, are subtended by chaffy scales or glumes. This is represented by the grasses and the sedges, several beds being devoted to each of these families. Some of the more familiar grasses are: timothy; Kentucky blue-grass; reed canary-grass; orchard grass; red-top; and tall fescue-grass; all used in making hay. Other grasses of interest are: sweet vernal-grass, exhaling a pleasant odor when bruised; the Japanese plume-grass, in several forms, very ornamental; the ribbon-grass, a variegated form of the reed canary-grass, and also ornamental; and species of many other genera.

The sedges are represented mainly by the large genus *Carex*, of which there are many species, native in the United States, growing in swamps, meadows, and woodlands. Fraser's sedge (*Cymophyllus Fraseri*) is a striking plant from the southeastern United States, at one time one of the rarest of plants, but rediscovered in recent years in large quantities in the mountains of North Carolina. The tussock sedge, common in our swamps in early spring, the cat-tail sedge, Gray's sedge and the fox sedge, are others belonging to the genus *Carex*. There are also representatives of bullrushes and other sedges.

Following the sedges is the arum family, having as representative plants, familiar to many, the skunk cabbage, the green arrow-arum, the green dragon, the jack-in-the-pulpit, and the sweet flag. In the brook opposite to this family may be found the somewhat related duckweed family; the duckweeds (*Lemna*) are very common, the tiny plants sometimes occurring in such numbers as to cover the surface of ponds and slowly moving streams. Coming now to the

spiderwort family, we have represented mainly the spiderworts and day-flowers. In a small pool and along its eastern edge is placed the pickerel-weed family. Here may be found a large clump of the pickerel-weed (*Pontederia*) which is common in swamps and along streams in the vicinity of New York; here may also be found the water-hyacinth, which has become such a pest in some of the rivers of Florida and the West Indies, and the closely related blue water-hyacinth, of more straggling habit, also of tropical origin, planted out in summer; neither of these is hardy; they may be found at all times at conservatory range 1, house 9.

The rush family occurs next in the sequence, represented, among others, by such familiar plants as the common bog-rush, the slender rush, and the common wood-rush. Following this come the members of the bunch-flower family, with several species of bellworts, the turkey-beard, the Japanese toad-lily, the fly poison, and others. Closely related to this is the lily family; one of the beds given over to this family is devoted to the true lilies (*Lilium*) in several forms; another is set aside for the onions and their relatives, of which there are many interesting forms, some of them of decorative value; while another bed is given to a miscellaneous collection of plants belonging to this family, among which may be mentioned the day, or plantain, lilies, the yellow day lilies and the lemon lilies, the true asphodel or king's sword, the grape-hyacinth and Adam's needle. Other close relatives of the lilies belong to the lily-of-the-valley family; here may be found many familiar plants, among them being the lily-of-the-valley (*Convallaria*), the wild spikenard, the common asparagus, of such wide use as a vegetable in the early part of the summer, and several species of the Solomon's-seal.

The amaryllis family is shown by a number of species of daffodils and narcissus. In the iris family, which comes next, many species are represented. Most familiar among these are: the common blue flag of our swamps, the yellow

flag of Europe, the fleur-de-lis, the Siberian iris, the Japanese iris and the blackberry lily. For the canna family reference is made to the plantations at the Garden fountain at the approach to the museum building, to the large collection of different kinds at the Horticultural Garden, and to house 11 of conservatory range 1; cannas are not hardy and must be removed to a warm place for the winter. For orchids, the most highly developed of the endogenous plants, reference is made to conservatory range 2, houses 2 and 6B.

Crossing the brook now by the path paralleling the driveway, we come to the beginning of the sequence of the large series of plants with net-veined leaves and with two seed-leaves (dicotyledons). This series begins with the lizard's-tail family, represented here in the brook by the lizard's-tail (*Saururus*), a common plant of our brooks and river borders in the eastern United States. To the nettle family one bed is at present given, located near a group of magnolia trees, where may be found, among other kinds: the slender nettle, of North America; the stinging nettle, native in Europe and Asia, but introduced into this country; and the wood nettle, also a North American plant; all of these secrete an oil through the hairs covering the stem and leaves, this oil being irritating to the skin, especially in the stinging nettle. In the immediate neighborhood and to the right is the birthwort family, represented by several species of wild ginger (*Asarum*), among them the common one of this region, the short-lobed wild ginger, the root of which is of medicinal value. To the buckwheat family there are at present devoted three beds, forming a group to the left of the nettle family. The docks (*Rumex*) are shown in many forms, as are the knotweeds (*Polygonum*) and related genera; the most showy of these are the Japanese and Sakhalin knotweeds; the latter, a plant of considerable economic importance, being used as a fodder plant, is a native of the Sakhalin Island; to this family also belong rhubarb, or pie-plant, and buckwheat. Next to this

and near the brook is the goose-foot family, with several species, one of which, the lamb's-quarters (*Chenopodium*), is native of Europe and Asia, but is found as a common weed in waste places and along roadsides in this country; its young shoots are sometimes used as a vegetable. Closely related to this, and just south of it, is the amaranth family, represented by several species of the pigweed, many of them among the commonest weeds of our roadsides and waste places. Forming a series to the right of this are: the whitlow-wort, four-o'clock, pokeweed, carpetweed and purslane families. In the whitlow-wort family are gnawel, a common weed of fields and waste places, and the forked chickweed. In the four-o'clock family may be found the common four-o'clock of our gardens, a native of tropical America, its flowers opening only on cloudy days or late in the afternoon on clear days, whence its name; and the umbrella-worts, from North America. In this vicinity is the Madeira-vine family, to which belongs the genus *Basella*, here represented. The pokeweed family is present in the common poke or garget (*Phytolacca*), native of the eastern part of North America, a plant of medicinal value and poisonous, but its young shoots when first appearing above the ground are sometimes used as "greens." In the carpetweed family are the carpetweed, from which the family derives its name, a native of the United States and Mexico, but a common weed in this vicinity; and representatives of the south African fig-marigolds (*Mesembryanthemum*), many of them very showy; they are not hardy in this latitude and must be planted out every spring. In the purslane family, among others, may be found the sunplant or common portulaca of the gardens, a native of South America; the small-flowered talinum, from the central United States; and the common purslane or pusly, a pernicious weed in many sections of the country, and often used for "greens" or as a salad.

Then comes the chickweed family, with sandworts, chick-

weeds and related plants. The pink family follows, where many kinds of pinks, catchflies, and gypsophils may be found. In the first pool, formed by the widening of the brook, is the water-lily family; the large yellow pond lily or spatterdock, a native of eastern North America, may be seen here, as may also its relative, the red-disked pond lily, from northeastern North America; the sweet-scented water-lily, and its variety, the pink, or Cape Cod, water-lily, also find a place here. The tanks in the court of conservatory range I contain a great many additional kinds. The water-shield family, is represented in the pool by the water-shield, a native of North America. The horn-wort family likewise occupies a position in this pool. The aquatic members of the crowfoot family are grown here, the terrestrial forms being placed in four beds to the westward; one of these beds is given up entirely to the peonies (*Paeonia*), of which there are a number of interesting and handsome forms, and others may be seen at the flower beds at conservatory range I; and in the other beds may be found lark-spurs, columbines, buttercups, meadow-rues, anemones, liver-leaf, and many other relatives; aconite, or monk's-hood, of great medicinal value, also belongs to this family.

The barberry family, which is represented by a single bed on the ridge to the right of the crowfoot family, contains, among others, the blue-cohosh and the may-apple or mandrake (*Podophyllum*), natives of North America; the twin-leaf, a native of the northeastern United States; and of Japanese plants, the red epimedium. In the poppy family may be found the oriental poppy, a native of Asia Minor and Persia, and here may be seen also the cordate *Macleaya*, from Japan, and the Mexican poppy, a native of Mexico and found as a weed in many tropical and warm temperate regions. In the fumitory family are the bleeding-hearts (*Bicuculla*), represented by the wild bleeding-heart from the eastern United States. The mustard family, which comes next in the sequence, occupies two beds. To

this family belong the candy-tufts, represented here by the evergreen candy-tuft, from southern Europe and Asia Minor, and the alpine rock-cress, from Europe and North America, one of the showiest flowers in early spring, its mantle of pure white flowers making it a conspicuous object; there are many other species represented in this group. The caper family has as representatives the showy pedicellaria, a native of the Old World, and the clammy weed (*Polanisia*), from northern North America. The white and yellow cut-leaved mignonettes (*Reseda*) represent the mignonette family. Across the path to the right, on the ridge and partly surrounding a rocky knoll, is the bed devoted to the orpine or stonecrop family, where there may be found many of the stonecrops (*Sedum*), among the more showy and attractive being: the great purple stonecrop, the great stonecrop, the white stonecrop, and the mossy stonecrop, all natives of Europe and northern Asia; the wild stonecrop from our own country; the Siberian stonecrop and the poplar-leaved stonecrop, both from Siberia; and a Japanese species, Siebold's stonecrop; also belonging to this family are the houseleeks (*Sempervivum*), of which there are many representatives, all from the Old World, however, as these plants are not indigenous to the New World. Many other species of this family, not hardy in this latitude, may be found at conservatory range 1, houses 5 and 6. Across the path from the orpine family may be found the three beds devoted to the saxifrage family. The heart-leaved saxifrage, with its large, thick leaves, from Siberia, is one of the showiest plants here, sending up its large masses of pink flowers early in the spring, so early sometimes that they are nipped by the frost. Among other plants here may be mentioned: the alum-root, from the eastern United States; the two-leaved bishop's-cap, from the northern United States; the Japanese plant, *Rodgersia*; and the shield-leaf saxifrage, from the western United States. Menzies' saxifrage, from western North America, is interesting from the fact that

in late summer and fall it produces small plants at the base of the leaf-blades.

To the herbaceous members of the rose family are allotted five beds, located to the left of the saxifrage family. Many species of cinquefoils and agrimonies may be found here; of the strawberry (*Fragaria*) there are several species represented; the lady's-mantle, from north temperate regions, the various species of avens, the goat's-beard, the burnets and many others, are of decorative value or of interest for other reasons. The roses, blackberries and raspberries, also members of this family, are shrubs, and may be found at the fruticetum. The mimosa family has relatively few representatives in temperate regions, most of its numerous members being confined to warm temperate regions and to the tropics; many of these may be found in house 2 at conservatory range 1, and others, including the attractive acacias from Australia, at the Central Display House, range 2. To the senna family belong the sennas or cassias, a showy representative being the American senna, a native of North America; this family being also largely of warm temperate and tropical distribution, many other species may be found at conservatory range 1, near the mimosa family. To the right of the mimosa family may be found the bed devoted to the pea family; to this some of our most valued economic plants belong, such as the pea, the bean and the clover, which may be found at the economic garden; to the pea family belong also the baptisias, the bush-clovers, the vetches, the tick-trefoils and many other familiar plants.

Next in the order of sequence is the geranium family, to which belong the geraniums or crane's-bills; the plants so often cultivated in the house under the name of geraniums, but which are not hardy out of doors in our climate, are really not what they are called, but are truly pelargoniums, a closely-related group of plants belonging to the same family; our common wild geranium or crane's bill may be found, among other plants here. A little farther on, near

the brook, may be found the bed devoted to the wood-sorrel family, often called sour-grass by children; several species are shown. Just to the left of the geranium family is the flax family, to which belongs the flax plant (*Linum*), from the fiber contained in the stem of which linen is made. Beyond this is the bed for the rue family; to this belong the common rue, of southern Europe, and the fraxinella; this family also includes the oranges and lemons, specimens of which may be found at conservatory range 2, and a very great number of tropical trees and shrubs, located at conservatory range 1, houses 3 and 4. The spurge family is in a bed just to the left of the flax family; the flowering spurge, from the eastern United States, and the cypress spurge, from Europe, but sometimes found wild in this country as an escaped plant, are both here. Along the edge of the brook, and opposite the spurge family, may be seen the water-starwort family, to which belong a number of small aquatic plants. About opposite this, and at the base of the rocky ridge to the right, is a representative of the box family, a Japanese relative, the terminal pachysandra; the true box (*Buxus*) is a shrub or small tree, native of Europe, and several races of it may be found at the fruticetum. A little to the right of the wood-sorrel family is the jewel-weed family, to which belong the common balsam of the gardens, and the plant so common along our brooks and other wet places, and known as jewel-weed, or touch-me-not. A little beyond this are three beds of the mallow family; the hollyhocks belong here, as do the mallows; the crimson-eye mallow and the swamp-rose mallow, both from North America, are showy representatives of this family; and the marsh mallow, a native of Europe and the Orient, is also shown; its root is used in the manufacture of a mucilage and for medicinal purposes.

To the right of the mallows is the bed given over to the St. John's-wort family. The rock-rose family comes next, a little farther on; here belong the rock-roses of Europe and

our own frost-weeds. To the right of this is the violet family; a collection of our native species, together with some from foreign lands, is here brought together and many of these may be recognized as old friends. Near the violet bed is one devoted to the loasa family. Upon the ridge to the right, across the walk, may be found the cactus family; relatively few of these are hardy in this climate, so the larger part of the cactus collection must be sought at conservatory range 1, houses 6, 7, and 8. Here may be found, however, several representatives of the prickly pears (*Opuntia*), including the eastern prickly pear, common in this part of the country, which is frequently found on the rocky ridges in the vicinity of New York and occurs wild on some ledges within the Garden reservation. Down near the brook, and not far from the mallow family, is the loosestrife family, represented by the purple loosestrife, a native of Europe, but introduced in many places in this country; among others belonging to this family is the swamp loosestrife, or willow-herb (*Decodon*), a clump of which may be found along the brook opposite to the loosestrife bed. But a short distance from the violet family is the evening-primrose family; here may be found a number of the evening primroses (*Oenothera*), with their showy yellow flowers, noteworthy as the plants mainly experimented with by Professors DeVries and MacDougal in their studies on the origin of species. Along the brook, not far from the loosestrife family, is the water-milfoil family, represented by the Chilean water-milfoil or parrot's-feather, forming a beautiful mass of feathery green on the surface of the water. Returning now to the ridge, a little beyond the violet family, we find the bed allotted to the ginseng family; here are the Indian-root, from eastern North America, and the heart-leaved aralia from Japan. To this family also belongs the ginseng plant, the root of which is so much prized by the Chinese as a medicine. Down the slope from this group may be found two beds given over to the carrot family, which includes many

economic plants, such as the carrot, parsnip, celery and caraway, all of which may be found at the economic garden; lovage, a common European plant, is shown, and the rattlesnake-master, from the eastern United States; the wild carrot and the golden meadow parsnip also belong here.

To the primrose family, located at the base of the ridge a little beyond the carrot family, belong the primroses (*Primula*), many of which are natives of Europe; here we find the common European primrose, the cowslip and others; the moneywort, a native of Europe, but introduced into many places in this country, sends its long creeping stem all over the bed—this is sometimes known as creeping Charlie; the fringed loosestrife, from North America, is also here, as is the clethra-like loosestrife, from Japan, with its racemes of white flowers. Between the two beds devoted to the carrot family, and a little beyond, is the plumbago family, to which belongs the common thrift of Europe; there are several other thrifts here also, as well as the statices or sea-lavenders, in several species. The bed allotted to the gentian family may be found a little beyond the plumbago family; among them is the blind gentian, a native of the United States. In the brook, just beyond the little stone bridge, may be found the buck-bean family; here are shown the water-snowflake, common in tropical regions, and the water-lily floating heart, native in Europe and northern Asia.

Just beyond the left-hand bed devoted to the carrot family is the dogbane family; the willow-leaved amsonia, from the central and southeastern United States, and the broad-leaved amsonia, from the central and eastern United States, are conspicuous objects here. Beyond this are two beds of the milkweed family and among its representatives are the common milkweed of our roadsides, the hairy milkweed and the swamp milkweed; the swallowworts also belong here and are illustrated by several species. In the morning-glory family, located to the right of the above, are the small bind-weed, of northern Europe and Asia,

sometimes a troublesome weed in this country, and the morning-glory. Following the milkweeds is the phlox family; interesting plants here are the Jacob's-ladder (*Polemonium*), of Europe, with its masses of blue flowers; the hairy phlox, of North America; Britton's phlox, a relative of the common ground phlox, from the southeastern United States; the ground phlox and its white-flowered form, both natives of the eastern United States; and forms of the garden phlox, from the southeastern United States. In the shade, the natural habitat of many of these plants, is the water-leaf family, at the base of a large rock on the ridge; there are the purple, the broad-leaved, and the Virginia water-leaf (*Hydrophyllum*).

Farther along and at the base of the ridge is the borage family; the tuberous comfrey, the rough comfrey and the common comfrey, all natives of Europe, are represented. In the vervain family, in a small bed to the left, may be found the vervains. We now come in the sequence to the mint family, to which are devoted six beds; among the true mints may be found here the creeping whorled mint, the curled mint and the spearmint, all from the Old World. Many familiar plants may be seen in these beds, and among them are: the false dragon-head, of the United States; motherwort, common in Europe and widely distributed as a weed in this country along roadsides and in waste places; the horse-balm, of North America, common in the east in woods; Oswego tea, and other bergamots, natives of North America; the betony and hyssop, of Europe; the hedge-nettles, from both the Old World and the New; the common sage of the Mediterranean region, highly prized by the housewife, and other sages; catnip, a native of Europe, but widely distributed as a weed in this country; Gill-over-the-ground, or ground ivy, also a European plant, but extensively spread as a weed in this country; and the dittany, of North America.

The potato family may be found a little to the left and just beyond the phlox family. Here may be seen the

common jimson, or Jamestown, weed, the seeds of which are poisonous, a native of tropical regions, but a common weed along our roadsides; the nightshade, a European plant, but commonly distributed as an introduction in many parts of this country, also with poisonous fruit; tobacco plants and solanums; it is to this family that the potato, tomato and egg-plant belong, plants of which will be found at the economic garden. A little beyond and to the left of the mints are the two beds allotted to the figwort family; of interest here are: the beard-tongues, of which there are several species; the speedwells (*Veronica*), among them the long-leaved speedwell and the gentian speedwell; the fox-gloves (*Digitalis*), from one of which, the purple fox-glove, the valuable medicine digitalin is derived; Lyon's snake-head from the southern states; culver's-root, from the southeastern United States; and several figworts. Just beyond this may be found the unicorn-plant family, represented by the unicorn-plant. A little beyond is the globularia family, with a single species of globularia. To the right is the acanthus family; not many of these plants are hardy in this latitude, but in house 2 at conservatory range 1 many representatives may be found, as the family is largely confined to tropical and warm temperate areas; in this bed may be seen the hairy ruellia, from the southeastern United States. In this neighborhood may also be seen the lopseed family, represented by the lopseed, a native of eastern North America.

To the right of the acanthus family is the single bed devoted to the plantain family; several species, such as Rugel's plantain and rib-grass, are pernicious weeds in this neighborhood, often disfiguring an otherwise even lawn. Just beyond the mints may be found the two beds of the madder family; to this belongs the dainty little bluets or innocence, which sometimes give a blue sheen to sterile, sandy places, so abundant is it in some localities; it is quite common in eastern North America; several species of bedstraw (*Galium*) may also be found here, while many

other plants belonging to this family are grown at the conservatories, among them the coffee tree. A little beyond is the single bed of the honeysuckle family, represented by the feverworts; this family being largely composed of woody plants, many other species, including the true honeysuckles, may be found in the fruticetum and in the viticetum. To the left is the valerian family with a single bed; here may be found the valerian, a common European plant.

Just beyond the plantain family is the teasel family. It is to this that the teasel plant belongs, used in olden times for raising the nap on woolen cloth. Several species of cephalaria may be found here. Next in sequence is the gourd family, to which belong such common fruits as the cucumber, muskmelon, watermelon and pumpkin, specimens of which will be found at the economic garden. The bell-flower family is a little farther on and to the left of the teasel family; the Carpathian and Host's bell-flowers, both natives of Europe, are pretty representatives here; the creeping bell-flower, or Canterbury bells, also a native of Europe, may be found here in several forms; the Japanese bell-flower and its white variety are also here, their large showy flowers making them quite conspicuous. A little further on and to the left is the lobelia family; the cardinal flower and the great lobelia, both natives of North America, make showy objects; the former is particularly striking in its rich masses of cardinal-red flowers.

To the right of the teasel family is the chicory family. The common lettuce (*Lactuca*), so much used in salads, belongs here and specimens of this will be found at the economic garden; many of the plants are extremely weedy by nature, and this is particularly true of the hawkweeds, a genus richly represented in the Old World, several species of which are shown here; the oyster plant is also a member of this family.

To the left of this may be found the ragweed family. All the species here are of a weedy nature. The ragweed,

the giant ragweed and the common clot-blur find representation here. Terminating the sequence comes the very large thistle family, represented by many species from all parts of the world; there are nine beds at present given over to these plants; the sunflowers, coneflowers, thistles, asters, fleabanes, yarrows, golden-rods, tansies, sneezeweeds, burdocks, artemisias and wormwoods, cat's-foot, tick-seeds, elecampane, boneset, chrysanthemums, colt's-foot and many others are shown; the Jerusalem artichoke, one of the sun-flowers, a native of eastern North America, bears edible tubers.

9. Morphological Garden

This is located to the north of the herbaceous garden, the two collections being separated by the driveway which crosses the valley. It is designed to illustrate here with typical examples the organs and other features of plants, including leaf-forms and the various modifications of their margins, their venation and insertion on the stem; also the various kinds of stems, methods of propagation, flower-clusters and fruits, leaf-movements, parasites, desert plants and seed-dispersal. Looking north on this collection, the first bed to the right of the brook contains plants illustrating simple leaf-forms. Immediately following this on the same side of the brook are the plants representing the various forms of compound leaves, or those in which there is a distinct jointing of the leaflets to the leaf-axis. Farther along the brook, in the pool, may be found various forms of aquatic roots, stems and leaves; and a little beyond this to the right is the bed containing plants illustrating forms of propagation.

The remaining plats of this collection are located on the left hand or westerly side of the brook. The first of these to the right is devoted to leaf-venation, and the one to the left to leaf-margins, the former illustrating the character of the veins and nerves, and the latter the toothing or lobing of the margins. Beyond this to the right is the group of plants showing the manner of insertion of the

leaves on the stem; and to the left of this are specimens illustrating the various ways in which plants may form a mosaic covering on the ground. A little beyond are the examples of stem-forms; one bed shows the smaller kinds, while for the larger examples, illustrating tree-twining, root-climbing and tendril-climbing stems, specimens have been placed to the left of this.

A little beyond the pool may be found the bed illustrating flower-clusters, and still farther on that devoted to parasitic plants, or those deriving their nourishment from the living tissues of other plants. To the left of this and farther up the hill is the group of plants showing leaf-positions. Beyond and a little to the right are plants which are at home in desert regions, and the various means of accommodating themselves to their natural surroundings are shown. Farther on to the right is the bed devoted to fruit-forms; and to the left of this, one showing various forms of seed-dispersal, those with the surface of the fruits covered with some sticky substance or curved appendages or hooked hairs or spines requiring the intervention of some animal for their distribution, while those with wings or with hairs attached to the seed are spread through the agency of the wind. To the right of the above are plants representing a species and a variety, and to the left of this is a bed containing plants showing species and hybrids.

10. Economic Garden

The collections illustrating food plants and those producing substances directly useful to man in the arts, sciences and industries are planted at the northern end of the long glade containing the herbaceous collections just described. The collection is arranged in two series divided by a central grass walk. The beds on each side are numbered consecutively, the number being indicated on a wooden stake in the center. A general sign is placed in each of the beds, denoting what its contents are intended to represent, and in front of each plant is a smaller label giving individual information.

On the east side of a broad central grass path and the brook are located plants used for medicine, those employed as condiments or relishes, and a number of plants from which the fiber is used in the manufacture of various fabrics. The medicinal plants which grow in wet or moist situations may be found on the easterly side of the brook. Along the woodland border is also a collection of medicinal shrubs and trees.

On the west side of the grass path and brook are the food plants. Here may be found many of the common fruits and vegetables. Along the gravel path is a collection of shrubs and trees, containing some of the more common plants producing edible nuts and fruits.

In the eastern series, bed no. 1, located at the northern end, contains plants used as condiments and relishes; here, among others, are peppermint, spearmint, mustard, lovage, lavender, savory, caraway, dill, coriander, basil, marjoram, anise, balm, sage, tarragon, and horse-radish. Beds 2, 3, 4, 6, and 7 contain drug plants. In beds 2, 4, and 6 it is the roots and rootstocks which are employed; such drugs as valerian, Indian physic, convallaria, sanguinaria, podophyllum or mandrake, inula, belladonna, pleurisy-root, rhubarb, cimicifuga, arum, tussilago or coltsfoot, and caulophyllum are here. In bed 3 among the commonly known drugs are catnip, tansy, horehound, and stramonium, the leaves of which furnish the active principles. In bed 7 are plants from the herbage, seeds or flowers of which drugs are manufactured; hops, tussilago or coltsfoot, rue, tobacco, castor-oil, digitalis and dulcamara are some of these. Bed 5 contains plants from which fibers are obtained, such as cotton, flax, used in the manufacture of linen, hemp, and broom-corn, from the inflorescences of which brooms are made. In the adjoining woodland border of shrubs and trees are the prickly ash, barberry, witch hazel, cramp-bark, rhamnus, frangula, euonymus, red-root, shrub yellow-root, and hydrangea. Along the east side of the brook will be found calamus and magnolia.

In the western series, devoted to food plants, in bed no. 1, located at the north end of the first line of beds, are plants the bulbs of which are useful for food; among these are onions, garlic, chives, and leeks. In the adjoining bed 10, the first of the second line, are those furnishing tubers for food, such as the sweet-potato, Irish potato, and Jerusalem artichoke. In bed 18, the first in the third line, are plants with fleshy roots, such as celeriac, oyster-plant, radishes, turnips, carrots, and beets. In beds 2 and 3 it is the leaves which are edible; familiar examples are cabbage, kale, lettuce, Brussel's-sprouts, collards, chicory, Chinese mustard, fetticus, endives, and spinach. In bed 4 are plants, the herbage of which is used; examples here are French spinach or orach, and rocket salad or roquette. It is the stems and leaf-stalks of the plants in bed 11 which are edible; here are asparagus, rhubarb, sea kale, kohlrabi, cardoon, and celery. In bed 5 are cauliflower and broccoli, the flowers being the edible portions.

Many plants furnish food in the shape of fruits. A fruit is developed from the flower, thus differing from a vegetable, which is the edible portion of some part of a plant other than the fruit. Beds 6 to 8, 12 to 16, and 19 to 27 contain plants which furnish edible fruits. These divide themselves generally into two kinds, those in which the fruit is more or less fleshy, such as berries, pumpkins and beans, and those in which the seeds only furnish the food value, such as wheat, barley and other grains. In bed 6 are the egg-plant and okra. In bed 8 will be found peas, beans, and fennugreek; in bed 12 the various kinds of tomatoes; in bed 13 the different sorts of peppers; in bed 14 strawberries; beds 19 to 26 contain each a single kind, as follows: crookneck squash, pumpkin, muskmelon, citron, watermelon, Hubbard squash, English marrow, and cucumber.

In the group containing the grains are the four common cereals, wheat, rye, oats and barley, all in bed 7. In bed 15 are the different kinds of sweet corn. In bed 16 are the field corns, both flint and dent, and popcorn. In bed 27 are buckwheat, sorghum, and rape, among others.

Beds 9 and 17 contain fodder plants. Bed 9 has fodder plants other than grasses, such as alfalfa, red, white and crimson clovers, winter vetch, summer vetch, yellow lupine, blue lupine, and Florida beggarweed. In bed 17 are fodder plants of the grass family, such as teosinte, Johnson grass, field corn, timothy, Kentucky blue-grass, red-top, and pearl millet. In bed 28 is the sugar-cane plant, from the juice of which sugar, one of the most important articles of food, is made; this is a native of the tropics, and it is therefore not hardy in our climate—plants of it may be seen at all seasons at conservatory range 1, house 9.

In the border of woody plants along the gravel walk are such familiar fruits as the hazel-nut, black, red and white currents, gooseberry, blackberry, black-cap, elderberry, chinquapin, barberry, huckleberry, and highbush blueberry. Along the west side of the brook will be found rice, not hardy here, which furnishes the principle article of food for millions of people, especially in the tropics of the Old World; the cranberry plant; taro, also not hardy, an important article of food in the tropics, largely taking the place there of the potato in temperate climates; and water-cress.

11. Decorative Woody Plants

Many collections of this nature will be found in various parts of the grounds. They consist of trees and shrubs, both deciduous and evergreen.

Along the driveways and paths will be found many kinds of deciduous trees, and in the arboretum many other kinds may be studied.

Groups of deciduous shrubs will also be found in many places along the roads and paths, and in the fruticetum, where these are arranged in families, the decorative groups are in close proximity to the families to which they belong. In the fruticetum will also be found a number of evergreen shrubs. Other places where the decorative value of shrubs may be studied are: along the west border, from the Woodlawn Bridge south to the approach to the elevated

railroad, and at the foot of and paralleling this approach; along the south border; and in the beds in the vicinity of conservatory range 1. Evergreen shrubs, or small trees which may be used in the same manner as shrubs, are divided into two groups, those with broad leaves, such as the rhododendron, known as broad-leaved evergreens, and those with narrow leaves, sometimes like needles, such as pines, hemlocks, spruces, firs, and yews, known under the general term of coniferous evergreens. The rhododendron is one of the most popular of the broad-leaved evergreens. Collections of rhododendrons may be seen on the east and south banks of the upper lake, just behind the museum building; at the west end of the Boulder Bridge; in front of the fountain at the museum building; and on the north side of conservatory range 1. One of the best broad-leaved evergreens for this latitude, and hardy except during a winter of extreme severity, is the Japanese holly, *Ilex crenata*, fine examples of which may be found in some of the beds in the vicinity of conservatory range 1 and at the Mansion.

Coniferous evergreens, as individual specimens, may best be studied in the pinetum. Groups of these plants, used in a decorative way, may be found at the foot of the Woodlawn Bridge approach; at the fountain in front of the museum building; at the foot of the museum approach; at the west end of the Long Bridge; in the beds at the foot of the terrace at conservatory range 1; and in the other beds to the north of the same range. As examples of the mixed planting of deciduous shrubs and of various evergreens, beds nos. 1 to 7 at conservatory range 1 may be cited as an example.

12. The Japanese Cherry Collection

This collection, a part of the deciduous arboretum, is located to the westward of conservatory range 2, in a little sheltered valley which opens out on the main road and the Bronx River. There are about 100 trees in the

RHODODENDRON BANKS AND LAKE BRIDGE

VIEW IN THE JAPANESE CHERRY GARDEN

group. It is to the great patience and care of the Japanese that we are indebted for the great variety in color and form of this truly charming flower. The first to bloom are the rosebud cherry (*Prunus subhirtella*) and the weeping cherry (the variety *pendula*), their rosy blossoms appearing at about the same time, near the middle of April. Following these some two or three weeks come the varieties of *Prunus serrulata*, the earlier ones blossoming usually about the first week in May, the flowering period being continued through the later varieties for two or three weeks. The flowers are single in the variety known to the Japanese as Yoshina, in others they are somewhat double, and quite double in the variety *classica*, to the Japanese known as Fugenzo, and elsewhere often as Jas. H. Veitch, under which name it is usually offered in nursery catalogues. The flowers of this variety are of a deep rose and the foliage a bronzy hue, while in others the flowers are paler, and in some varieties even white; the foliage varies from bronze to bright green. This cherry bears little if any fruit, the great effort of the plant being turned toward the creation of blossoms, of which there is a great abundance. Individual trees, at the height of their season, are literally covered with a mantle of charming flowers. It is no wonder that the Japanese hold this flower in such great esteem.

13. The Rose Garden

This is situated in a little valley east of the Bronx River, and a short distance south of the Mansion. It is of irregular shape, containing about an acre and a quarter, and is about 350 feet long and 200 feet wide at its broadest part. The beds outside of the intramarginal path are planted mainly to such roses as have a short flowering period, commonly known as June roses. Here will be found the hybrid perpetual, the hybrid sweetbrier, the Ramanas, the Bourbon, the moss, the China, and the cabbage roses. Inside of the path above mentioned, are many beds containing hybrid tea, Pernetiana, and dwarf

polyantha roses; these types bloom practically the season through, beginning late in May or early in June and in some varieties blossoming until killing frosts arrive.

None of the plants in the beds outside of the intramarginal path require protection in winter; to prevent whipping in the wind and consequent loosening of the plants in the soil, the long stems are cut back to about three feet late in the fall. The roses in the other beds, however, are protected by hilling up the earth for a distance of six or eight inches around each plant, much as is done with potatoes. This protects the wood from too violent freezing and drying, insuring enough good live wood the following spring to provide the bloom for the coming summer. Each plant is furnished with a label giving the type of rose, the name of the variety, and the name of the donor.

The flight of stone steps which forms the western approach to the garden was the gift of the late Mrs. Robert E. Westcott.

14. Lilac Garden

This collection, located a little to the south of the rose garden and paralleling Pelham Parkway, is being developed. The lilacs are planted in groups around the margin, it being tentatively planned to establish a collection of peonies in the central portion of this area.

15. Flower Gardens

Collections of herbaceous plants useful for horticulture will be found in the border at the Elevated Railway approach; along the path leading from this approach to conservatory range I and in the beds in the vicinity of this range; and elsewhere. Something of decorative value is always to be found in these collections, from the appearance of the early bulb-plants, and other harbingers of spring to the arrival of the chrysanthemums in the fall. The plants are plainly labeled, so that the collections may be intelligently studied. If one is interested in establishing a home garden, notes may be made here of such plants as

appeal to the individual, and any color scheme for any period may be thus arranged for. It is not the purpose in these collections to develop any special color scheme, but to bring to the attention of the public as many different kinds as possible of herbaceous plants which may be used in the developing of individual ideas. Many other kinds of herbaceous plants which may be used for decorative purposes may be seen at the herbaceous garden.

The flower beds at conservatory range 1 are on the north side in two series numbered from west to east. One series contains seven beds; and the other, at the base of the terrace on which the conservatory stands, paralleling it on three sides, contains four beds. In these beds and in those on both sides of the path from the Elevated Railway approach to the conservatories are grown many kinds of bulbs, such as snowdrops, glory-of-the-snow, squills, spring crocuses, early tulips, cottage tulips, Darwin tulips, daffodils, poet's narcissus, snowflakes, lilies and fall crocuses. All bulbs have a resting period, their foliage disappearing at this time, leaving bare spots in the flower garden. To avoid this, annuals, or greenhouse plants raised from cuttings, are provided. These are sown or planted in time to follow the bulbs, thus giving a succession of flowers for the summer and fall. In addition to the bulbs there are many other kinds of herbaceous perennials here.

Bed no. 11, located at the foot of the east terrace, is devoted to roses. This collection was established in the spring of 1913. The bed is about 250 feet long and 8 feet wide. There are over 400 bushes, representing about 140 kinds, including hybrid perpetuals, hybrid teas, teas, baby ramblers, moss-roses and others. The two rear rows contain hybrid perpetuals, and a few other kinds, the two front rows comprising hybrid teas and teas.

16. Horticultural Collections

The horticultural collections are situated in the southern part of the grounds, and face the Southern Boulevard.

This area comprises about 5 acres, and is well diversified as to character of soil and conditions, offering level, hilly, rocky, dry, wet, sunny, and shaded areas, making it possible to grow a great variety of plants. It is designed to assemble here collections of plants suitable or desirable for horticultural purposes. A feature is made of the labeling, as in all other collections of the Garden, each plant being supplied with an information label; and, when necessary, a larger label for the bed or collection is employed, indicating its contents.

A large collection of different varieties of cannas occupies the beds paralleling the entrance walk from the Southern Boulevard and the large oval bed at the termination of this walk. The horticultural varieties of cannas are the result of hybridization and selection, and many varieties have been thus produced, new ones being introduced constantly. The species used in this work of hybridization are natives of tropical or warm temperate countries, and are of course not hardy here. The hybrids in consequence are not hardy, and it is necessary to remove the plants for the winter to a cellar or other storehouse where the temperature does not go to freezing, neither should it be too warm, for then the plants will start growth. Preliminary to removal, the stems should be cut a few inches above the ground, the plants being allowed to remain in their summer position until pretty well blackened by the frost. In the early spring the clumps can be broken up and the severed parts planted in flats or in pots, where they are allowed to remain until all danger of frost is past, when they may be planted in their permanent position for the summer.

Back of the north bed of cannas is a group of the white fir (*Abies concolor*), a native of our western country. Between this plantation of firs and the walk is a bed devoted to a collection of plants with variegated or colored foliage, making an interesting and instructive exhibit. Across the walk is a collection of chrysanthemums. To the

east and across the walk from this is a collection of the garden phlox, of which there are many kinds offered for sale and new ones constantly appearing. These are entirely hardy, and may remain out-of-doors continuously.

Along the south walk, on both sides, are beds containing a large collection of gladioli, representing numerous examples of the various types of this popular flower and many horticultural varieties. To the south of this is the Victory Grove, planted with Douglas spruce (*Pseudotsuga mucronata*).

In the low land on the east side is a large collection of mallows made up largely of hybrids produced here at the Garden during a series of experiments. Many of these are desirable for the garden, as the mallows, while naturally natives of moist or wet situations, will thrive under ordinary garden conditions.

Many other collections are planned for this area, including an iris garden, and will be developed from time to time as opportunity offers.

17. Dahlia Collection

This is located in that part of the west border extending from the Harlem Station plaza north to the Mosholu Parkway bridge, a distance of over 400 feet. One of the finest collections is exhibited here each summer, the blooms beginning to appear about the end of July and continuing in an unbroken succession until the time of killing frosts. The various types of the cultivated dahlias are exhibited in many examples, each plant being plainly labeled with the name of the type, the name of the variety, and the name of the donor. This is one of the most popular collections in the Garden.

The dahlia is a native of the highlands of Mexico, very few kinds being known in the wild state. The great diversity of form and color exhibited by the cultivated dahlia has been produced artificially by hybridization and selection. Not a hardy plant, it is necessary to remove the

tubers each fall, after growth has been stopped by the frosts, to a cellar or other storehouse where the temperature does not reach the freezing point, neither should it go much above 45 or 50 degrees.

18. Iris Collection

The iris collection at the southwest corner of the grounds was established in the spring of 1916. In front of a background of conifers and deciduous shrubs is a border 10 feet wide, in which the irises are planted. The iris may be had in flower, by proper selection of kinds, from early spring to the early part of July. The first to bloom are some of the dwarf forms, such as *Iris pumila* and *I. cristata*. Then come those of the rhizomatous type, with creeping rootstocks, such as *Iris germanica*, *I. pallida*, *I. sambucina*, and many others. These are followed by the Siberian irises, and these in turn by the Japanese irises, of which there are many beautiful color forms.

19. Water Garden

The water garden is situated northeast of the museum building between the lake bridge and the Bronx River. An attractive display of hardy water-lilies, many of them Marliac hybrids, may be seen here from June until autumn; while the borders of the lake are planted with a variety of water-loving herbaceous plants and shrubs.

20. The Hemlock Forest

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."

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

WATERFALL IN THE HEMLOCK FOREST

BRONX RIVER ABOVE THE LINNAEAN BRIDGE

considerable space on the eastern side above the mansion and below the boulder bridge. The area west of the river extends from just above this 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 waterfall at the 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 spruce, and although they form its predominant vegetation, other trees are by no means lacking; beech, ash, sweet birch, red maple, hickories, 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 hemlock, 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.

21. The Gorge of the Bronx River

The gorge of the Bronx River extends from the boulder bridge at the north end of the hemlock forest southward for about a mile, nearly to Pelham Avenue, and is a most

beautiful and picturesque natural feature, besides being of great geological significance. Its depth from the summits of the hills on both sides averages nearly 75 feet, and its sides below the foot-bridge at the mansion are nearly vertical rock faces. The hills on both sides are heavily wooded with hemlock spruce and other trees. In the upper part of the gorge the river flows slowly, being held back by the dam forming the waterfall at the mansion, and the elevation of its surface is only a few inches higher at the boulder bridge than it is at the fall; after plunging over the dam, however, the river runs in its unobstructed natural channel with all the appearance of a mountain stream, which at high water is exceedingly beautiful.

22. North Meadows and River Woods

The Bronx River enters the northern end of the Garden from Williamsbridge and flows as a slow stream southward to the waterfall at the mansion, its surface being nearly level throughout this distance. It is spanned just inside the northern boundary of the Garden by a concrete-steel arched bridge with granite copings, which carries the main park driveway across it near the Bronx River Parkway entrance. The entire northern end of the Garden is formed of the flood plain of the Bronx River, consisting largely of grassy meadows and marshes which at average flow of the stream are several feet above its surface, but which at flood time are occasionally submerged for short periods, the whole valley being a very interesting illustration of the behavior of a small stream with a large watershed at and about its sources. Considerable areas of the marshy land have already been reclaimed by filling, and by the lowering of the dam forming the waterfall at the mansion; the general plan contemplates a much further reduction in the amount of marshy ground, and a further lowering and deepening of the river by dredging, in order to take off freshets with greater rapidity. A part of this flood-plain is occupied by the plantations of willows and poplars already described,

and these will be considerably extended, but large areas of meadow will be left in their natural condition.

South of these open meadows, the valley of the river is much narrower and is occupied by several acres of characteristic river woods, containing a considerable variety of native trees and shrubs, extending south as far as the long driveway bridge near the northern end of the hemlock forest.

23. Deciduous Woodlands

The natural deciduous woodlands of the reservation are, collectively, over 40 acres in area, mostly in the central and southern portions of the tract, where they occupy rocky ridges and some of the valleys between these ridges. Along the Bronx River, from the boulder bridge north to the north meadows, are several acres of river woods, subject to overflow at freshet periods. The woodlands contain many species of native trees and a much greater number of kinds of native shrubs and herbaceous plants; the undergrowth is, locally, very dense. They are typical illustrations of forests of our part of the country, and are treated and protected as such. Dead and decrepit trees are removed and dead branches pruned off from time to time; where necessary, young trees are planted to replace those cut out; the woods are patrolled to guard against forest fires. All available firewood obtained is burned in the heating plants of the smaller buildings, and the use of coal is thus reduced. In order to keep these woodland tracts as typical illustrations of eastern United States forests, no extraneous plants have been brought into them, except in one small area on a bank just east of the fruticetum, where many herbaceous woodland species not native of the region have been planted.

PARK FEATURES

The whole plan of the development of the Garden has been designed in such a manner as to include all the features of a public park, and it has been carried out in close cooperation with successive park commissioners and engineers of

the Borough of the Bronx. The grounds are open to the public every day in the year without any charge whatever.

24. Entrances

The Garden has entrances at ten points, as follows:

1. Mosholu Parkway. 2. Bedford Park Avenue. 3. Southern Boulevard. 4. Iris Garden. 5. Linnaean Bridge. 6. Mansion Approach. 7. Arboretum entrance (not yet completed). 8. Allerton Avenue. 9. Bronx River Parkway. 10. Woodlawn Road.

25. Roads and Paths

An elaborate series of driveways provides several miles of Telford-Macadam roads, most of which are now constructed.

Paths located so as to lead to all the principal features are included in the plan, with an aggregate length of over fifteen miles and approximately three-fourths of this system has already been built, and there are several miles of forest trails.

All the roads and paths have been located so as to do no damage to the natural features of the grounds, particular care having been taken to save all possible standing trees and to avoid disturbing natural slopes except in the immediate neighborhood of the large buildings, where considerable grading has been necessary, but even here the study has been to adjust the new surfaces so that they shall merge imperceptibly into the original ones. Ornamental masonry retaining walls, made necessary by the grades of the roadways, have been built at the Mosholu Parkway entrance, at the Woodlawn Road entrance, and at the approach to the Elevated Railway Station, and vines have been planted at the bases of these walls which partly clothe them with foliage. The Bronx Boulevard, bounding the Garden to the east, is supported along part of its length by a high rubble-stone retaining wall.

NORTH BRIDGE

BOULDER BRIDGE

26. Bridges

The plan of the driveway and path systems called for the construction of six bridges; three of these, first, the lake bridge, crossing the valley of the lakes near the museum building; second, the long bridge, which carries the driveway across the valley of the Bronx River north of the hemlock forest; and, third, the upper bridge which crosses the Bronx River at the northern end of the Garden, have been carried out in masonry arches from designs by Mr. John R. Brinley, landscape engineer of the Garden. A unique boulder foot-bridge of five arches, just at the northern end of the hemlock forest was built from designs by the same engineer. The concrete-steel bridge spanning the gorge of the Bronx below the waterfall was built by the Park Department; and the sixth bridge in the plan is a foot-bridge, temporarily built of wood, ultimately designed in concrete, crossing the Bronx River in the north meadows.

The bridge dedicated to Linnaeus, which carries the Pelham Parkway across the river, is appropriately located between the Botanical Garden and the Zoological Park.

27. Water Supply and Drainage

The water supply has also been constructed in accordance with the general plan and the system has been extended from year to year as the development of the grounds proceeded. Drinking fountains and public comfort stations have been erected at various points.

The drainage of the grounds has been carried out in accordance with a well-studied original plan, which provides outlets for the surface drainage for the most part either into the lakes or into the river, very little of it being taken into the sewers. Only a small portion of the drainage system still remains to be built.

28. Shade Trees and Border Screens

The park treatment further calls for the planting of shade trees where these are needed along the driveways,

and much of this has been done, a great many kinds of trees having been used, and many shrub plantations have been set out, especially at roadway and path intersections, utilizing considerable numbers of the same kinds of shrubs at different points.

The general planting plan includes provision for partially surrounding the grounds, except at entrances, with border screens. This planting has already been accomplished along the western and northern boundaries, and partly along the southern and eastern boundaries. These screens are composed of a very great variety of trees and shrubs, variously grouped, and average about fifty feet in width.

29. Shelters and Pergolas

Only a few of these ornamental, as well as useful, structures have been erected, but the plan of development includes a number of them, and also several decorative fountains.

LAKESIDE SHELTER

A concrete shelter-house stands by the path on the southwestern side of the upper lake, which lies just west of the water garden. The southern and eastern banks of this lake are decorated with masses of rhododendrons, mountain laurel, and other shrubs and trees.

HERBACEOUS GARDEN PERGOLA

A small, hexagonal, concrete pergola stands in a triangle formed by three paths in the forest edge on the eastern side of the herbaceous garden.

SCHOOL GARDEN SHELTER

This was completed in 1918 with funds contributed by Mrs. Frederick Ferris Thompson. It is very attractively located on a high rocky cliff overlooking Long Lake and the valley containing the Rose Garden.

UPPER LAKE AND LAKESIDE SHELTER

SCHOOL GARDEN SHELTER

PART OF THE BORDER SCREEN

DOCENTRY

Docentry

In order to provide a method for viewing the collections under guidance, a member of the Garden staff leaves the front door of the Museum Building every week-day afternoon at 3 o'clock, to escort all who may wish to accompany him. The routes are as follows:

Monday: Hemlock Forest, Mansion, and Herbaceous Garden. Tuesday: Pinetum. Wednesday: Fruticetum and North Meadows. Thursday: Deciduous Arboretum, Nurseries and Propagating Houses, and Public Conservatories, Range 2. Friday: Public Conservatory Range 1. Saturday: Museums.

Rules

1. The picking of flowers, leaves, fruits, nuts, or the breaking of branches of any plants, either wild or cultivated, the uprooting of plants of any kind, the defacing of trees, and the carrying of flowers, fruits or plants into or from the grounds of the Garden, are prohibited, except by written permission of the Director-in-Chief of the Garden.

2. Leaving or depositing paper, boxes, glass or rubbish of any kind within the grounds of the Garden is forbidden.

3. Dogs are not allowed within the limits of the Garden except in leash.

4. It is forbidden to take fish from within the Garden, or to molest in any way squirrels, birds, snakes, frogs, toads, turtles or any other wild animals.

5. Throwing stones or other missiles, playing ball, football, tennis, or other game is prohibited.

6. It is forbidden to offer for sale food, candy, newspapers, books, tobacco, beverages, flowers or any other objects, without written permission from the Director-in-Chief and the Commissioner of Parks for the Borough of The Bronx.

7. Boating or rafting on the ponds, lakes, and streams is forbidden.

8. Trucking, or the driving of business wagons of any kind, is forbidden on the roads of the Garden, except on those designated for such purposes.

9. It is forbidden to accept or solicit passengers for any cab, carriage, or other conveyance, at any point within the grounds of the Garden without written permission from the Director-in-Chief of the Garden and the Commissioner of Parks for the Borough of The Bronx.

10. Visitors are not allowed within the Garden after eleven o'clock at night nor before six o'clock in the morning except upon driveways and paths designated for their use between those hours.

The Garden is also protected by all city ordinances referring to the Park System.

EXPLANATION OF MAP

1. Public Conservatory Range 1	30. Woodlawn Road Entrance
2. Water-lily Tanks	31. Salicetum
3. Elevated Railway Station	32. North Bridge
4. Power House No. 1	33. Bronx River
5. Bedford Park Entrance	34. River Woodlands
6. Botanical Garden Station	35. North Meadows
7. Mosholu Parkway Entrance	36. Bronx River Parkway Entrance
8. Museum Building	37. Deciduous Arboretum
9. Pinetum	38. Power House No. 2
10. Flower Gardens	39. Public Conservatory Range 2
11. Southern Boulevard Entrance	40. Allerton Avenue Entrance
12. Herbaceous Garden	41. Stable
13. Pergola	42. Propagating Houses
14. Morphological Garden	43. Nursery and Experimental Gardens
15. Economic Garden	44. Arboretum Entrance
16. Viticetum	45. Long Lake
17. Deciduous Woodlands	46. Rose Garden
18. Hemlock Forest	47. Mansion
19. Gorge of the Bronx River	48. Park Department Barn
20. Gorge Bridge	49. Park Department Band Stand
21. Waterfall	50. Park Department Shop
22. Boulder Bridge	51. Park Department Greenhouses
23. Long Bridge	52. Picnic Grounds
24. Lower Lake	53. Mansion Entrance
25. Water Garden	54. Linnaean Bridge
26. Lake Bridge	55. Linnaean Bridge Entrance
27. Upper Lake	56. Iris Garden Entrance
28. Lakeside Shelter	57. Iris Garden
29. Fruticetum	58. White Pine Plantation

GENERAL PLAN

OF

THE NEW YORK BOTANICAL GARDEN

1920