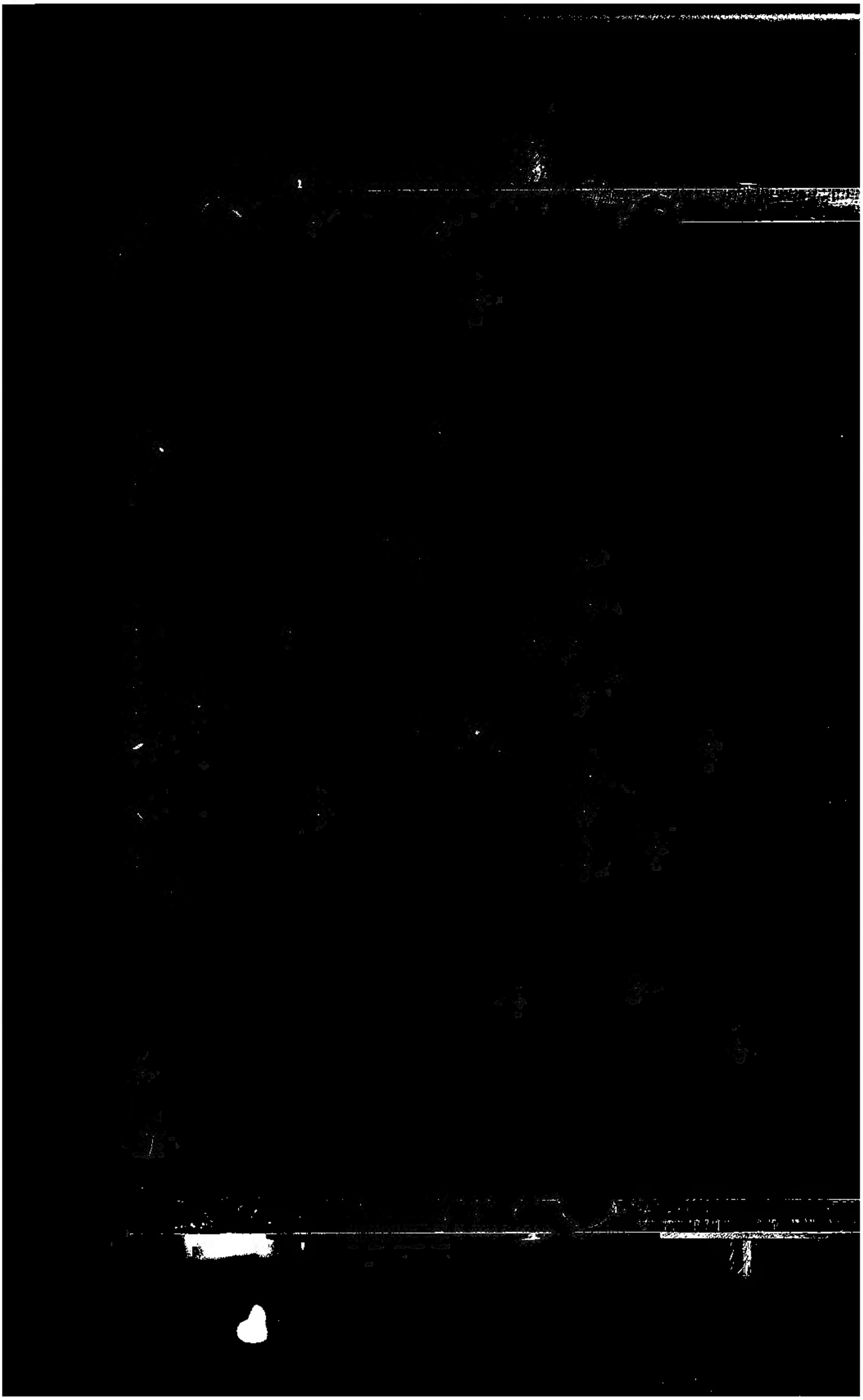

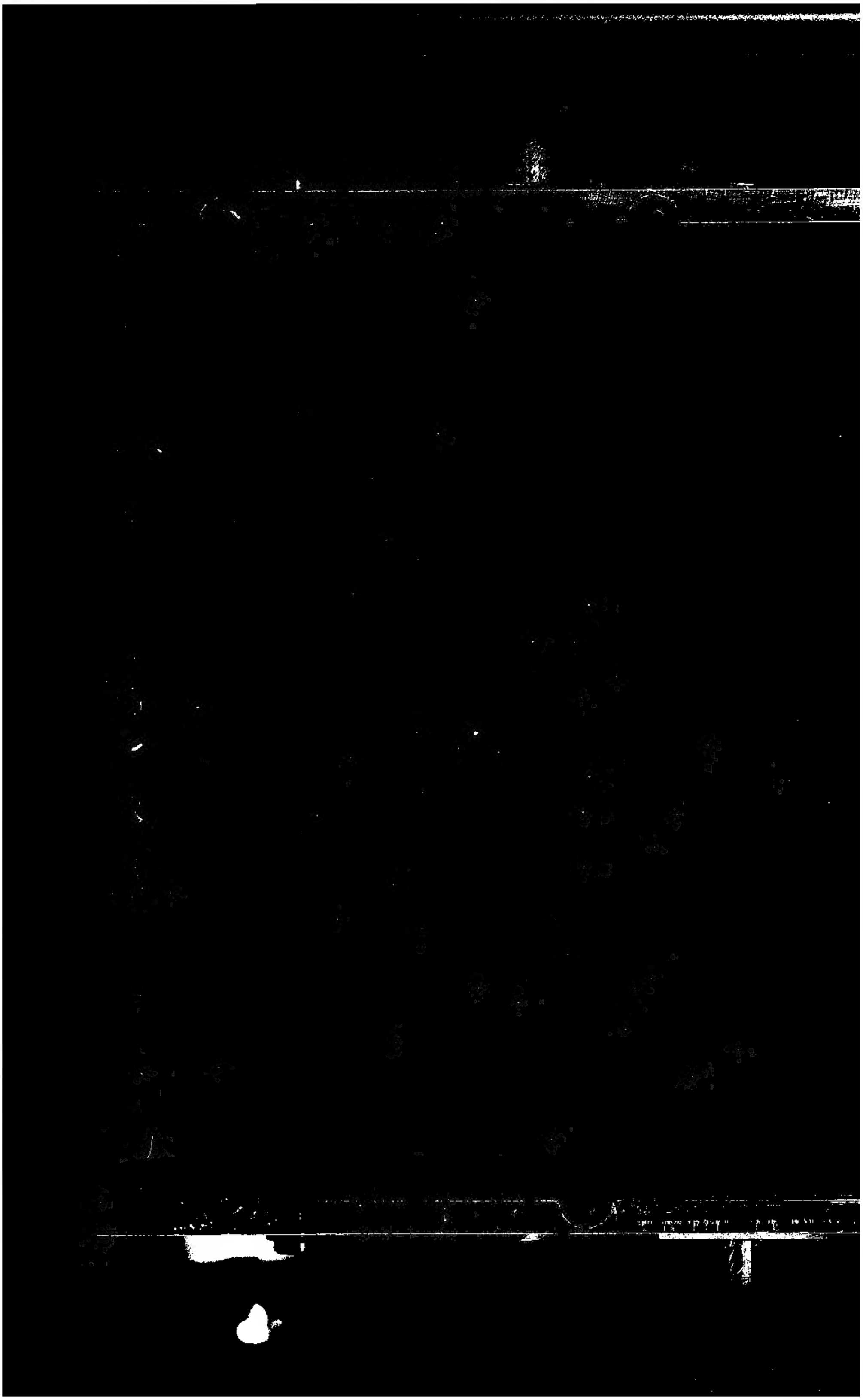

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The New York Botanical Garden

EDITOR

MARSHALL AVERY HOWE

VOLUME XXX

WITH 59 TEXT-FIGURES AND 1 PLATE

1929

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NATURALISTIC PLANTINGS OF EARLY-FLOWERING BULBS

One of the annual members of The New York Botanical Garden was so impressed with the success of the naturalistic planting of Narcissi that he offered one hundred dollars to start a fund to be used for the naturalization of Scillas and other small bulbs. With this suggestion and the aid of this same member, Mr. Walter R. Marvin, in planning the color arrangement and in advising how to raise the necessary money required, we were able to collect a fund of fifteen hundred and ninety-nine dollars with which we purchased eighty-eight thousand, five hundred bulbs of Scillas, Chionodoxas, Snowdrops, Grape Hyacinths, and Crocuses. This fund has been contributed by Garden Clubs, Horticultural Societies, and interested friends of The New York Botanical Garden, many of whom gave before when we were collecting for the Narcissus Fund.

The site chosen for the planting is adjacent to Conservatory Range No. 1, on a most attractive slope, dotted at wide intervals with large pine-trees. A path over three hundred and fifty feet long passes below this hill and meets another which runs from the Prize Garden of 1926 to the main driveway. Both sides of the latter path have been planted and a long slope up the hill from the drive, besides a small corner under some lilacs near the Museum Building. A color plan was made and the varieties chosen accordingly, this plan being followed closely during the planting. The crocuses are placed in the foreground, yellow being brought to the front and blues behind after the manner of the artist Cezanne. It will be noted that the varieties used are relatively few and the quantities large of each sort, which is good practice for a fine effect.

FIGURE I. Planting crocuses, September, 1928. Three men are working together, one with bulb-planter, one putting in bulbs, and one replacing the sod-plugs. Photograph by E A. S. Peckham.

The actual work was done with six of Barr's bulb-planters and the labor of sixteen men. These tools take out a plug of sod, the bulbs are set in the hole, and the plug put back and stepped on. The whole number of bulbs were planted in five and a half days. Naphtha flake was sprinkled in the holes with the crocuses to discourage mice.

FIGURE 2. Planting bulbs, September, 1928. Note parcels of 500 crocus bulbs each, at extreme left.

The bulbs were purchased from Messrs. M. Van Waveren & Sons Ltd. of Hillegom, Holland, being imported in one shipment. Because they were to be used in a public park this firm made a great reduction in price and sent the very finest stock they had at their disposal. The bulbs came in splendid condition, excellently packed and were delivered the last week in August, planting being started the twenty-first of September.

There ought to be an attractive display in the spring but a plantation such as this should improve each year, as the plants seed themselves and make natural increase.

I should like to take this opportunity personally to thank all those who contributed to this fund and who helped in any way with work, advice, and criticism. The interest and enthusiasm shown has been of the greatest assistance.

Lists of donors and of the varieties used follow:

Varieties Used

Muscari, Heavenly Blue (Grape Hyacinth). 5000. Bright blue.
Chionodoxa gigantea (Glory of the Snow). 2000. Light blue.
Chionodoxa sardensis (Glory of the Snow). 9000. Dark blue.
Scilla bifolia (Two-leaved Squill). 5000. Purple blue.
Scilla sibirica (Siberian Squill). 8000. Bright blue.
Galanthus nivalis (Snowdrop). 6000. White.
Crocus susianus. 5000. Yellow and brown.
Crocus aureus. 7000. Yellow.
Crocus King of the Whites. 2500. White.
Crocus Mont Blanc. 5000. White.
Crocus purpurea grandiflora. 6000. Purple.
Crocus Pallas. 1000. Striped.
Crocus Sir Walter Scott. 1000. Striped.
Crocus versicolor. 2000. Striped.
Crocus Lord Palmerston. 1000. Mauve.
Crocus Maximilian. 13,000. Mauve.
Crocus Mme. Mina. 8000. Striped.
Crocus biflorus. 2000. Striped.

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ETHEL ANSON S. PECKHAM.

NOTES ON SOME IRIS TROUBLES

I. THE IRIS BORER, MACRONOCTUA ONUSTA

The iris borer has not worked in the irises in the test and variety plantings at The New York Botanical Garden the past summer. Large numbers of the larvae were, however, found in a bed of *Iris tectorum* in the border planting at Conservatory Range No. 1. The borers had just begun to pupate August 2, when the bed was cleaned out and replanted. FIGURE 3 shows some of the larvae taken from a few square feet of this bed. Two pupae are shown at X in the figure. The moths hatch out in September and lay their eggs on old leaves and débris in the beds. Such rubbish is regularly burned in our larger iris plantings, but it is not practicable to do this work so thoroughly in a border where many different kinds of plants are grown. This probably accounts for the numbers of borers found in the bed of *Iris tectorum*.

If the eggs are not destroyed by burning the débris before spring, it may be necessary to spray the plants with arsenate of lead. The United States Department of Agriculture Farmers Bulletin 1495 recommends adding nicotine sulphate and soap.

II. THE POD EATING CATERPILLAR

Dr. A. B. Stout directed the writer's attention to the damage being done in the iris breeding grounds by the zebra caterpillar, which was feeding not only on the leaves and flower-stalks but also on the valuable seed pods. No further damage was noticed after the plants were sprayed with arsenate of lead and whale-oil soap.

III. SCLEROTIUM DELPHINII

Plants in certain beds of bearded irises have been rapidly dying out for the past two or three years. There are a number of varie-

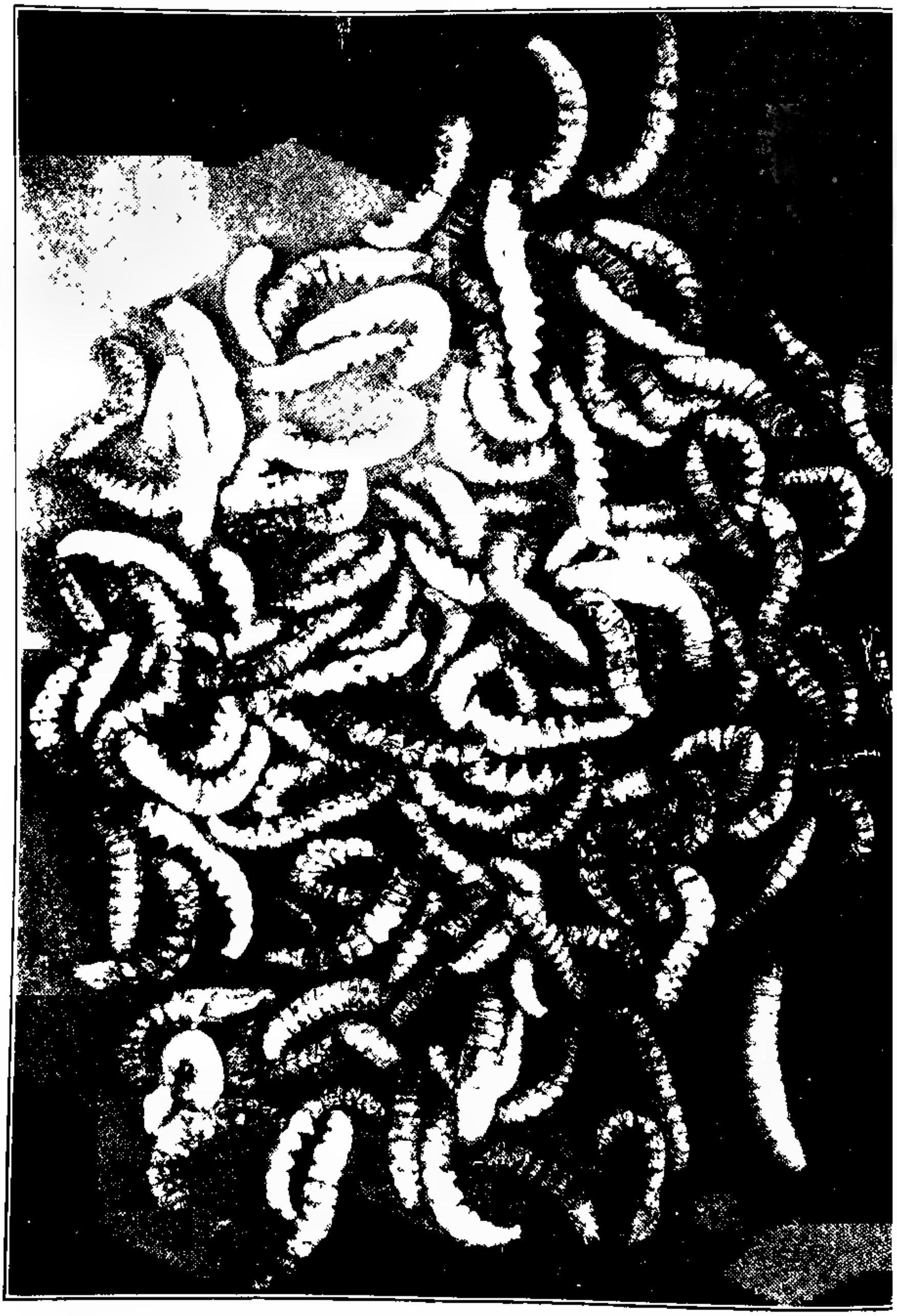


FIGURE 3. Larvae of the iris borer *Macronoctua onusta*. Two pupae above X. Slightly reduced.

ties in each bed and as none of the varieties has escaped it looks as if the disease were not highly specialized. As noted elsewhere, the iris borer was not working in these beds in the summer of 1928. Making due allowance for the fact that the beds are several years old, and are located on sloping land where washing might bring on root exposure followed by freezing and heaving in winter, there still remains the question of disease.

The manner in which the disease is spreading is well shown in FIGURE 4. The area showing dying plants bordered by healthy ones developed during the past summer. In May a fine clump of the variety B. Y. Morrison was in bloom at the point X in the figure. These plants have since died, clearly due to infection by *Sclerotium Delphinii.* Sclerotia were gathered from the base of dead or dying leaves and on the ground several times during July and August, and the fungus was isolated from the interior of the decaying growing region of these and similar plants.

The same fungus destroyed most of the plants in a bed of aconite. Frequently one finds a large number of sclerotia about the base of a dead plant (FIGURE 5). Every plant in a bed of Physostegia near by was also killed by this fungus during the month of August.

The sclerotia begin as little club-shaped masses of whitish fungous growths. These bodies tend to round up and turn pale tan-brown, then darker reddish brown. They are about the size of mustard-seed or bird-shot when mature. The fungus was so commonly present in these beds where plants were dying out that there would not have been any question as to the cause of the disease were it not for other factors which demanded consideration later in the summer.

In addition to the species of Chaetopsis to be noted in connection with the Japanese irises, maggots of a small fly identified by C. H. Curran as *Scaptomyza graminum* Fall were frequently found working in decaying leaf-bases. This species is known to do considerable damage to species of the grass family and may account for some of this iris trouble.

During October several plants developed a rot starting in the leaves and working down into the growing region of the rhizome. Owing to the strong foul odor present this rot was attributed to *Bacillus carotovorus.* Bacteria, yeasts, and other fungi were

present, most of them clearly as saprophytes. Such rots were not present in plants found dying earlier in the season.

A species of Fusarium was frequently isolated from decaying leaves and rhizomes, but on the whole the evidence seems to support the view that *Sclerotium Delphinii* was the primary cause of most of the trouble.

Since the soil in the iris beds noted above must have been thoroughly inoculated with sclerotia and mycelia, the opportunity for determining the effect of soil sterilization on the development of the disease in replantings was at hand. On August 25, the soil in two of the most seriously affected beds was dug up and all of the old rhizomes were thrown out. Formaldehyde, 2 : 100, was applied to a certain area at the rate of about one half a gallon to a square foot. Another part was treated with Dip Dust, 1½ lbs. to 75 sq. ft., by Dr. C. R. Orton. Another area was left untreated as a control. New plants of a number of different varieties were brought in by Mrs. W. H. Peckham from a distant region where all the plants were in a healthy condition. These were set out September 6, some of them first being treated with uspulun. At this writing none of the new plants had developed a rot.

IV. Japanese-Iris Maggots

At the suggestion of Professor R. A. Harper, the writer made some observations on clumps of Japanese irises, the leaves of which were turning reddish brown and dying prematurely in August and September. Frequently all of the plants in such a clump die out. A species of thrips could often be found working on the inner surfaces of folded leaves. The effect of these insects seems to be to scar or roughen the leaf surface so that it turns a mottled reddish color.

Sclerotium Delphinii and *Fusarium* sp. occasionally develop in damp chambers, when such plants are kept a few days. One is struck, however, with the frequency with which he finds maggots of a small fly, Chaetopsis, working in the tender inner leaves of these unhealthy plants. The maggots pupate in the folds of the leaves attacked and pupae may also be found on the soil at the base of the plants. The pupae are brown and about one quarter of an inch long. Flies hatched out were identified for the writer as either *Chaetopsis aenea* or *C. fulvifrons.* Westwood (Gar-

FIGURE 5. Sclerotia of *Sclerotium Delphinii* at the base of stalk of aconite killed by this parasite.

deners' Chronicle, p. 493, 1888) refers to an iris fly, Agromyza, whose larvae burrow in the leaves of varieties related to *Iris orientalis*. The insect working in our Japanese irises is clearly a different fly from the one described by this author, and quite unlike the Scaptomyza noted previously as working in the decaying leaf-bases of the bearded varieties.

Later in the season it was noticed that the youngest or innermost leaves in which the larvae were working were black or streaked with black. Larvae of the lesser bulb-fly, *Eumerus strigatus*, are reported as working in iris rhizomes, but the ones attacking the Japanese irises work in the leaves and are much smaller. If one cleans off the old leaves and decayed parts and resets the plants in a new place, some of them recover, which is evidence that the maggots, and not parasitic fungi, are the primary cause of the trouble.

The reader is referred to an article to appear in the January number of the American Iris Society Bulletin by Dr. G. M. Reed, who also has been observing the destructive effects of this fly during the past summer.

B. O. DODGE.

II

THE PLANT LIFE OF AUSTRALIA AND NEW ZEALAND[1]

To one accustomed to the familiar vegetation of the North Temperate zone, a visit to Australia and New Zealand is like entering another botanical world. Not only are almost all of the species different from ours, but most of the genera and even many of the families are entirely unfamiliar. Indeed, most of them are confined largely or entirely to the Australasian region. There is evidence that in many cases these are ancient forms of plant life which were once much more widely dispersed and have survived only in this somewhat remote corner of the world.

Australia is a huge island-continent approximately three thousand miles from east to west and two thousand miles from north to south, with about the area of the United States. It extends from 10° to 40° south latitude, and therefore displays a considerable range of climatic conditions and a corresponding diversity in plant population in its various regions.

In the northeast corner, and extending southward along the east border of Queensland, is a region of high temperature and heavy rainfall, with a distinctly tropical vegetation which much resembles the plant population of the adjacent Malayan Islands. Palms, screw-pines, giant figs, and aroids of all sorts are abundant; orchids are very common; epiphytic ferns, especially staghorns, are perched in the treetops, and lianas are everywhere.

Coming south into southern Queensland and New South Wales, with lower temperature and less rainfall, we find a more characteristic Australian vegetation. The Myrtle family is especially abundant, the omnipresent Eucalyptus or gum tree, with hundreds of species, being its most familiar type. Other myrtaceous genera, such as Tristania, Angophora, and Eugenia, are also common. The Legume family is well developed, Acacia, the "wattle," being next to Eucalyptus the commonest Australian plant and bearing the beautiful golden blossoms which add so much to the beauty of spring in the antipodes. The Proteaceae, a large family of woody plants, mainly confined to Australia and entirely absent

[1] Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, November 17, 1928 (in substitution for another lecturer and subject announced for that date).

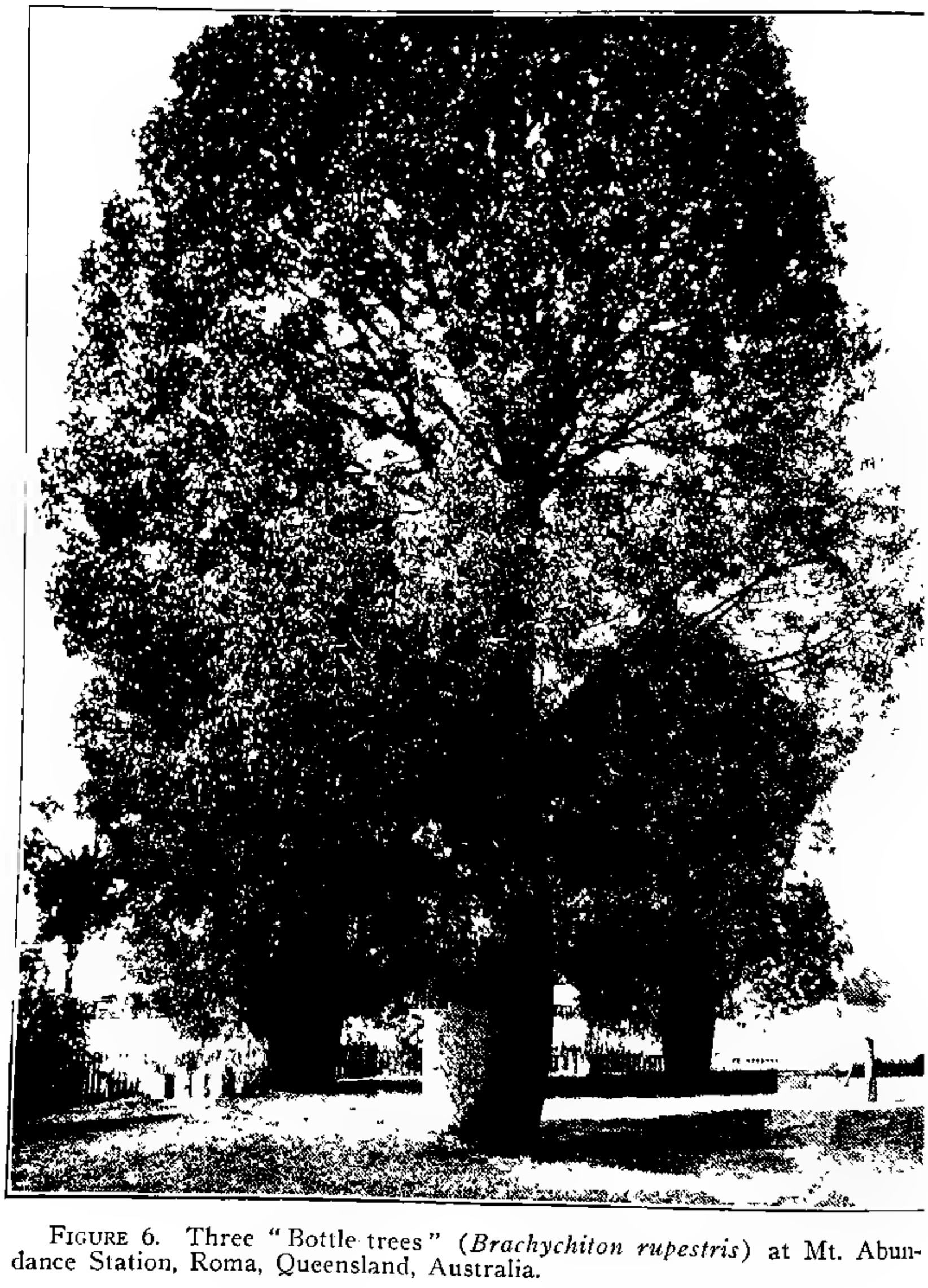


FIGURE 6. Three "Bottle trees" (*Brachychiton rupestris*) at Mt. Abundance Station, Roma, Queensland, Australia.

in North America, are also conspicuous and include Grevillea (the silky oak), Banksia, Hakea, and many other genera. The conifers are represented by two fine species of Araucaria, with their large and curious cones, several species of Podocarpus, and the cypress-like Callitris. Herbaceous plants and ferns are relatively infrequent. Many plants odd to our eyes occur here, such as "grass trees," "bottle trees," and others. Cycads are not uncommon.

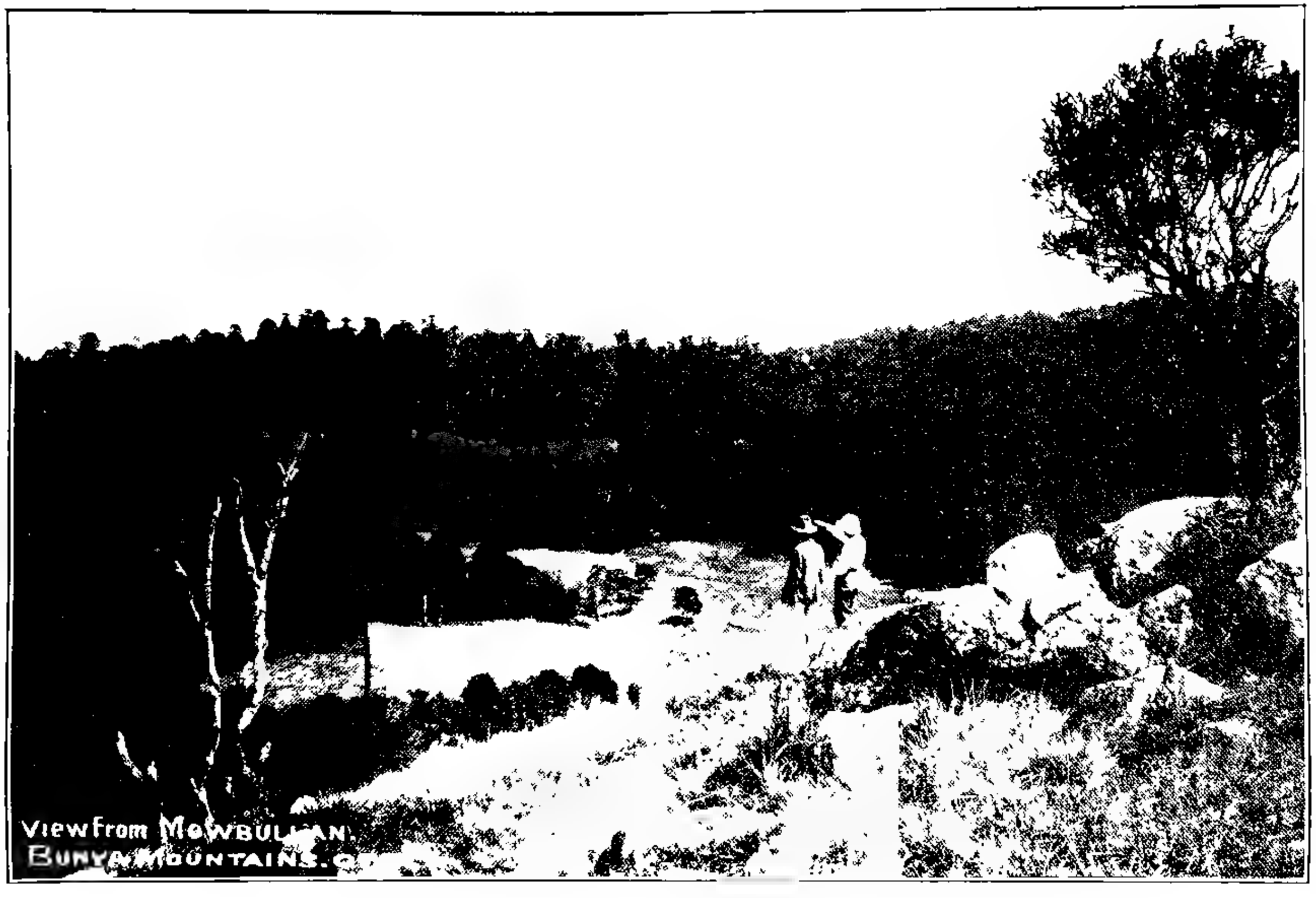
As we pass inland in New South Wales the rainfall is less and the characteristic Australian plants, mostly rather xerophytic in type, predominate still more. The forests are chiefly of Eucalyptus trees and through their vertically hanging leaves the sunlight filters readily, so that deep shadows are absent. Farther westward, open grassy plains appear, which stretch off to the more arid interior of the continent.

In the southeast coast region one finds the country well watered and more mountainous and here, particularly in the State of Victoria, grow splendid forests of gum trees which often attain a height of over three hundred feet and are nearly as tall as our California "Big Trees."

The island of Tasmania, just off the coast, has a high rainfall and somewhat resembles New Zealand in climate and flora. In its plant population are many characteristic "antarctic" plants.

The central region of Australia is a desert with very little vegetation, but, as one approaches the west coast, plants become more abundant, and in number of species this area is exceeded by few in the world. Here there are well-marked wet and dry seasons and most of the woody plants are consequently somewhat xerophytic, but these are accompanied by a considerable herbaceous flora which flourishes when moisture is abundant. In West Australia the typical Australian families—Myrtaceae, Proteaceae, Leguminosae, Goodeniaceae, and many others—reach their fullest development, and many botanists believe that they originated here in earlier geological periods, when this region was an island, and that later they spread to the eastern part of the continent after land connection had been established.

New Zealand is much smaller than Australia and in size and shape somewhat resembles an inverted Italy. It consists of two


View from Mowbullan
Bunyan Mountains.

large islands, is mountainous in many portions, and has a temperate and equable "insular" climate. Rainfall is relatively high throughout, and in some places is so abundant that "rain forest" vegetation is developed. The north island, which runs well up toward the tropics, is not very warm, and even at the southern end of the south island, which faces the Antarctic seas and is as far from the equator as Newfoundland, freezing temperatures are rare except in the mountains. All this results in a relatively homogeneous vegetation.

Coniferous trees are particularly abundant. The splendid Kauri pine (*Agathis australis*) is the finest of these and often reaches more than ten feet in diameter. The primeval Kauri forests have unfortunately been largely cut off and the species propagates itself very slowly. "Pines" of various sorts, not our true pines but species of Podocarpus, Dacrydium, and other members of the Podocarpineae, are abundant and furnish a valuable supply of soft woods. There is a luxuriant fern flora, immensely rich both in species and individuals, so that New Zealand is a fern-lover's paradise. These plants here run through the whole range of fern types, from tall tree ferns (Cyathaceae) to small and delicate "filmy ferns" (Hymenophyllaceae), the leaves of which are only a few cells thick and are particularly adapted for life in the rain forests. Even our common bracken fern (*Pteris aquilina*), or a close relative, is found here, and its leaves often reach a height of six feet or more. Its stout root-stocks were long used as an important source of food by the natives.

New Zealand has many species and genera in common with Australia, but the characteristic "Australian" type of vegetation is largely absent. Its place is taken by conifers, ferns, and a considerable development of other woody and herbaceous types in which Metrosideros (the "rata"), Dracaena, Cordyline (the cabbage tree), Phormium (the New Zealand flax), shrubby Veronicas, Drimys (a magnolia without vessels in its wood), Celmisia, Olearia, Senecio, and others are conspicuous.

On the Southern Alps of the south island is a beautiful and characteristic Alpine flora, where the giant buttercup (*Ranunculus Lyallii*), the white or cream-colored flowers of which often reach a diameter of three inches, is abundant.

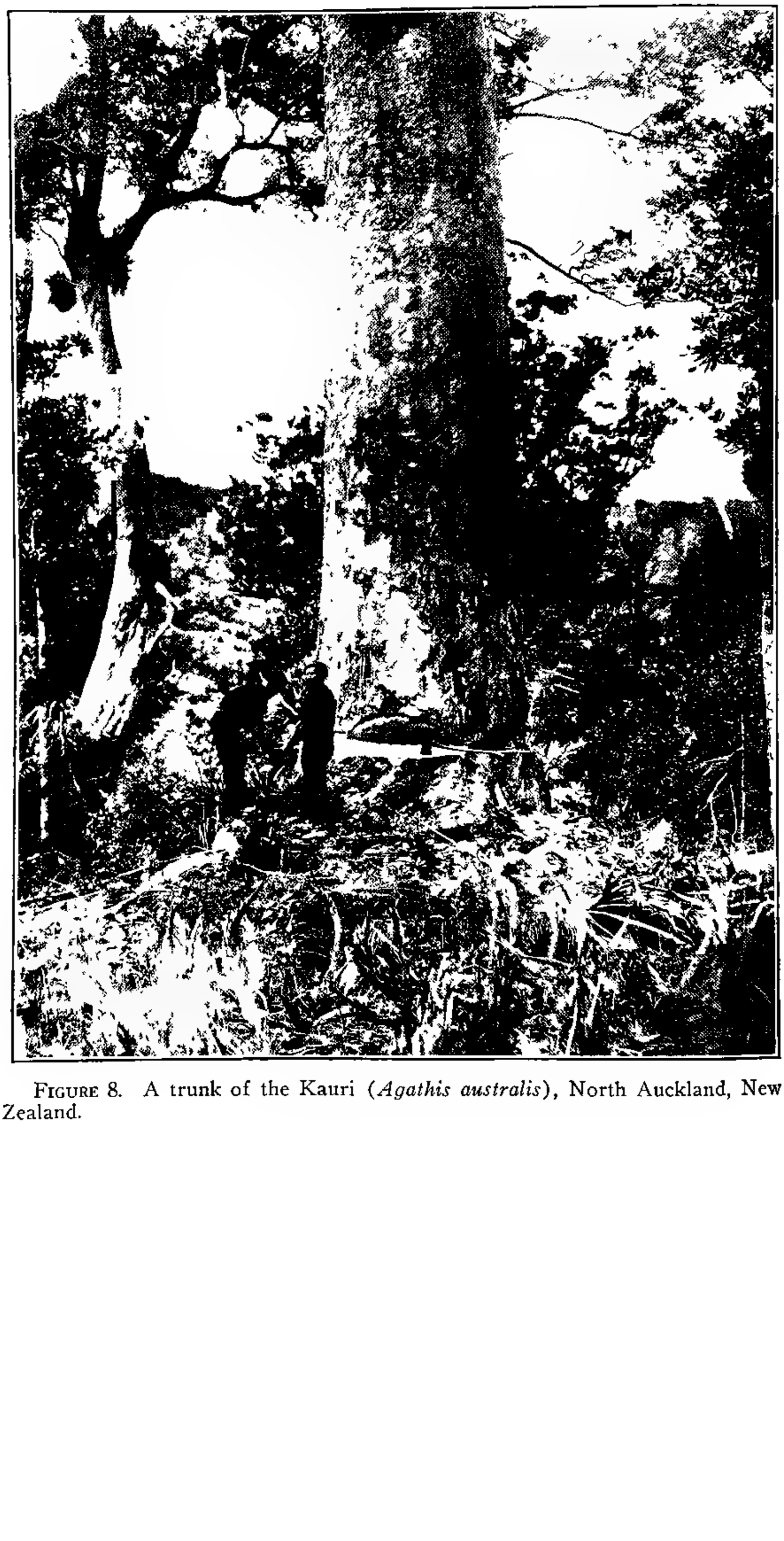


FIGURE 8. A trunk of the Kauri (*Agathis australis*), North Auckland, New Zealand.

FIGURE 9. Tree-ferns and other vegetation along the Whangarei Creek, Auckland, New Zealand.

The rugged region around the west-coast sounds in the south island, where the rainfall is very heavy and the temperature mild, has a vegetation of the utmost luxuriance and beauty, which is almost tropical in character.

An important element in the New Zealand flora is a group of "antarctic" plants closely related to similar forms in Tasmania, southern South America, and some of the Antarctic islands. Conspicuous among these are the Southern Beech (Nothofagus) and a considerable number of herbaceous species. These are believed to be remnants of the plant population of the Antarctic continent, which, as the cold increased, were driven northward from their original home.

Many European and American plants have been introduced and have become common in various parts of Australia and New Zealand; some happily so, like the English daisy and the gorse, and others unfortunately, as the prickly pear, which infests many parts of Australia. In general, however, the native plant population is still dominant and well repays the interest and study of botanists.

EDMUND W. SINNOTT.

THE BLOOMING DATES FOR RHODODENDRONS AND AZALEAS

The following data have been assembled from field records made during the course of hybridizing experiments. The dates as given are approximately the days when the species noted had reached the height of their full bloom. The blooming period of each species averages about two weeks, but some, notably *Azalea Kaempferi* and *A. obtusa*, may extend their season of bloom to one or two months according to the natural variation of early or late individuals or clons. One individual plant, however, will remain in bloom only about a fortnight. This table takes no account of "second" or summer bloom. Many species, after blooming in the spring, will display a few flowers in July, August, or September, but such blossoming is sparse, erratic, and largely affected by environment conditions, notably water supply. For purposes of comparison, data on all the species except where noted were gathered in one place, Hicks's Nursery, Westbury,

Long Island. These data cover only one season, and it should be noted that the dates of blooming and even the order of succession may vary considerably from year to year according to fluctuations in the weather. They may also vary under changed conditions of soil or shelter. The earliest species, for instance, bloomed from one to two weeks earlier at The New York Botanical Garden than the same species or varieties bloomed at Hicks's Nurseries. The following table of dates is, however, sufficiently dependable to be useful as a rough guide to the normal succession of bloom, as it represents a very typical season, that of 1927.

Date of Full Bloom	*Species*
April 15	*Rhododendron dahuricum.*
" 20	*R. dahuricum v. mucronulatum.*
(May 1)	*R. hippophaeoides* (2 weeks after *dahuricum* at The New York Botanical Garden.)
May 13	*Azalea Vaseyi.*
" 14	*A. obtusa* (vars. *amoena, Hinodigeri,* etc.)
" 14	*A. poukhanensis* v. Yodagawa and type species.
" 15	*A. Schlippenbachii.*
" 15	*A. Kosteriana* = *A. mollis* × *japonica.*
" 19	*A. Kaempferi.*
" 19 (?)	*R. yunnanense* (bloomed with *A. Kaempferi* at The New York Botanical Garden.)
" 20	*R. caucasicum* v. Boule de neige.
" 20	*R. carolinianum.*
" 20	*A. gandavensis* (The Ghent hybrids bloomed from May 15 to June 15, depending upon variety.)
" 25	*A. rosea.*
" 27	*A. ledifolia.*
" 27	*A. japonica.*
June 1	*A. pontica.*
" 2	*A. linearifolia v. macrocephala f. decandra.*
" 2	*R. Smirnowii.*
" 4	*R. Fortunei* hybrid.
" 4	*R. Kosteriana* v. Miss Louisa Hunnewell.
" 5	*A. calendulacea.*
" 10	*R. catawbiense* (type species.)
" 15	*R. ferrugineum* v. Wilson.
" 20	*R. hirsutum* v. Myrtle.
" 20	*A. arborescens.*
" 23	*A. indica* v. J. T. Lovett.
July 4	*R. maximum.*
" 8	*A. viscosa.*

The length of time from the blooming of the first plant until the blooming of the latest one may be conservatively estimated at four months for the vicinity of New York. In 1927 the first plant of *R. dahuricum* bloomed on April 1st and the last plant of *A. viscosa* did not stop blooming until after August 1st. Indeed, many plants of *A. viscosa* were still blooming at Hicks's Nursery as late as August 10th. The evergreen species begin with *R. caucasicum* and extend until nearly August 1st, when the last flowers of *R. maximum* disappear. By a proper choice of existing species and by the development of intermediate strains through hybridization and selection a continuous succession of bloom extending over a period of four months or longer can probably be secured.

CLEMENT G. BOWERS.

THE LANTERN SLIDE COLLECTION OF THE NEW YORK BOTANICAL GARDEN

Ever since the lecture courses at The New York Botanical Garden were begun, the collection of lantern-slides has gradually increased until on November first, 1928, when they were transferred to the care of Dr. Forman T. McLean, Supervisor of Public Education, the uncolored slides numbered 7700, and the colored 4531. Besides these there is a small collection of slides purchased from the Maria and Olivia Phelps-Stokes Fund for the Preservation of Native Plants, which includes 250. Many of these special slides are not suited to the general collection, but are eminently fitted to be used in schools and clubs for lectures on the protection of our wild flowers.

There have also been preserved 8503 negatives, which are useful for replacing slides that may be lost or broken, for obtaining prints to illustrate our publications, and to furnish occasional prints to others. There is also a series of photographs illustrating the history and development of the Garden. Records have been kept of individual lectures and the numbers of slides used, with the date and place at which the lectures were given, thus saving a good deal of time in case of repetition. Many of our staff are called on to repeat their lectures for Garden Clubs and this service

has usually been performed without charge, as an institutional contribution to the education of the people.

The topics which our lantern-slides were intended to illustrate cover a wide field of travel, including many botanical and economic subjects, as well as pure science, and illustrate the varied interests and knowledge of our staff and associates. They include also the allied subjects of the relations of birds and insects to plants and many of the common diseases and pests by which they are liable to be attacked. Our illustrations for travel talks emphasize the fact that the managers of The New York Botanical Garden have been very liberal in allowing the members of the staff much liberty and many opportunities for acquiring wider knowledge of the floras of various countries, both in America and abroad. They also emphasize the fact that the lectures given here at the Garden have kept us in touch with various other similar institutions. Through the generous coöperation of many men and women who have devoted themselves to the cultivation of plants, their economic uses, their aesthetic value for planting in towns and cities, and to questions of forestry and horticulture, we have learned of the work that others are doing. Little attention has been given to agriculture by our staff, but we have had the coöperation of many members of the United States Department of Agriculture and its local branches.

Besides the liberal coöperation of our associates and friends, the lantern-slide collection has received many generous gifts to illustrate special features of the Garden, such as the daffodil and iris collections, the Rock Garden, and the wild flowers of the local flora and of other parts of the United States. Special attention has been given to the food-plants of the American Indians, and to the use of many of our wild fruits and nuts for food. Some attention has also been paid to the plants used in medicine, and to the cultivated plants used in the manufacture of oils, perfumes, gums, resins, fibers, and foods.

We owe a deep debt of gratitude also to the photographers and colorists who have made so many beautiful records of wild and cultivated plants and to the members of the staff and their secretaries who have assisted in keeping a working index of the collection.

A study of the titles of our lectures also shows how devoted and untiring have been the efforts of our staff to interest and educate the public in our work and to promote the progress and dissemination of botanical knowledge.

ELIZABETH G. BRITTON,
Honorary Curator of Mosses.

WEISS'S PLANT LIFE AND ITS ROMANCE[1]

In this attractive little book Dr. Weiss has brought together a series of twelve radio talks for British school children. They cover the general groups of plants from the simplest to the most complex and are designed to give a summary picture of the evolution of the plant kingdom. Dr. Weiss knows his subject, without a doubt, and has presented it with scientific accuracy, but we have much respect for the British scholar, whatever his age, who can grasp the evolution of plants from this sketchy treatment with its few illustrations and abundance of technical terms.

H. A. GLEASON.

NOTES, NEWS, AND COMMENT

Dr. and Mrs. N. L. Britton left New York for Porto Rico on December 20, to continue their studies of the flora of that island. By going earlier than usual they expect to be able to see something of the vegetation of the southern side of the island before the advent of the dry season.

The annual meetings of the American Association for the Advancement of Science, the Botanical Society of America, the American Phytopathological Society, the American Society of Plant Physiologists, and other affiliated societies in New York City, December 27–January 2, brought many visitors to The New York Botanical Garden, especially on Sunday, December 30, which was devoted largely to excursions to local and nearby institutions.

Among the visitors to the library during the autumn were the following botanists: Dr. A. H. Chivers, Hanover, N. H., Dr. Ivan M. Johnston, Cambridge, Mass., Dr. B. E. Gilbert, Kingston, R.

[1] Weiss, F. E. Plant Life and its Romance. Longmans, Green & Co., 1928 I'p. viii + 136, fig. 13.

I., Dr. Walter H. Snell, Providence, R. I.; Profs. H. H. Whetzel and L. M. Massey and Mr. S. H. Burnham, Ithaca, N. Y.; Prof. L. O. Overholts and Mr. Geo. L. Zundell, State College, Pa., Mr. Edwin B. Bartram, Bushkill, Pa., Mr. E. P. Killip, Washington, D. C., Prof. G. W. Martin, Iowa City, Ia., Prof. Douglas H. Campbell, Stanford Univ., Cal., Mr. L. H. Knoche, San José, Cal., Mr. James A. Faris, Baraguá, Cuba, Prof. Eugene Schemtschouschniekoft, Novocerkassko, Russia, and Prof Alexis Leopoldoff, Krasnodar, Russia.

We much regret to record that the venerable Swedish willow-expert, Dr. Sven Johan Enander, whose work and whose recent visit to The New York Botanical Garden were described in the number of the JOURNAL for last September, is reported to have been found dead on December 18 in a gas-filled room in his hotel in Victoria, British Columbia. His death was evidently accidental. Although eighty years of age, he was full of enthusiasm for a projected two-years' journey around the world under the patronage of the Swedish Government.

Professor John M. Coulter, for nearly thirty years head of the Department of Botany of the University of Chicago and affectionately known to his numerous students and to many others as "the dean of American botanists," died at his home in Yonkers on December 23, in his 78th year. He was the author of the "Manual of Rocky Mountain Botany," "Manual of Texan Botany," and of various college texts on botanical subjects. He had been honored with the presidencies of Indiana University, Lake Forest University, the Botanical Society of America, the American Association for the Advancement of Science, the American Association of University Professors, the Chicago Academy of Sciences, etc. In 1875 he founded *The Botanical Gazette,* of which, until quite recently, he has remained one of the editors. In 1925, Dr. Coulter retired from the University of Chicago and became scientific adviser of the Boyce Thompson Institute for Plant Research in Yonkers. Since that date, he had been an occasional lecturer in the Saturday afternoon programs at The New York Botanical Garden on such subjects as "The Present Status of Organic Evolution" and "Original Exploration of the Yellowstone National Park."

Meteorology for December. The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: 55° on the 4th; *59° on the 15th; 59° on the 17th,* and 58° on the 25th. The minimum temperatures recorded were: 20° on the 9th; 24° on the 10th; *15° on the 23rd;* 25° on the 31st. The total precipitation for the month was 1.47 inches, .20 of which was the result of a 2-inch snow.

Meteorology for the year 1928. The total precipitation for the year was 37.685 inches, including a total snowfall of 15.25 inches, which is figured as equal to 1.525 inches of rainfall. This was distributed by months as follows: January, 1.65 inches (including .250 as melted snow or 2.5 inches snow measurement); February, 4.545 inches (including .375 as melted snow or 3.75 inches snow measurement); March, 2.56 inches (including .70 as melted snow or 7 inches snow measurement); April, 3.92 inches; May, 1.64 inches; June, 6.33 inches; July, 5.46 inches; August, 3.66 inches; September, 3.60 inches; October, 1.42 inches; November, 1.43 inches, and December, 1.47 inches (including .20 as melted snow or 2 inches snow measurement).

The maximum temperature recorded for the year was *96° on both July 8th and August 4th.* The minimum temperature was *5½° on February 27th.* The first killing frost of the autumn occurred on the morning of October 27th. The latest freezing temperature of the spring was 31° on April 18th.

Note: A slight error occurred in the monthly meteorological reports for January, February, and March, due to erroneous measurements of melted snow. The precipitation recorded for January was 1.425 (including 2½ inches snow measurement figured as .025 inches of melted snow or rainfall, which should have been figured as .25 inches of rain). This makes the total precipitation for January 1.65 inches. During February the snow was figured as .105 inches of rainfall, which should have been .375 inches, making a total precipitation of 4.545 inches instead of 4.275 as recorded. The total precipitation for March was 2.56 inches instead of 1.93 as recorded, due to the fact that 7 inches of snow measurement should have been figured as .7 inches instead of .07 inches of rainfall.

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GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of narcissi, daffodils, tulips, irises, peonies, roses, lilies, water-lilies, gladioli, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than one million specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 38,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural, and forestal subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————

All requests for further information should be sent to

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BRONX PARK, NEW YORK CITY

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THE CLON IN PLANT LIFE

I. THE BOTANICAL STATUS OF THE HORTICULTURAL CLON: ILLUSTRATED BY THE BALM-OF-GILEAD POPLAR

The clon is an important unit among horticultural plants and it may also exist in nature among wild plants which naturally reproduce by asexual methods. In considering the status of a clon it should constantly be held in mind that an entire clon, even though it comprises thousands of plants, is merely one seedling plant that has been multiplied by vegetative propagation. In respect to its extension by horticultural methods of asexual propagation, a clon of any cultivated plant is chiefly an artificial unit. But it is important to know how the clon arose, what its relation is to species and varieties as these occur in nature, and how it should be named. And so the clon has a botanical status that deserves consideration. But in botanical literature the tendency has been to give clons a specific or a varietal rank that is not warranted, and to bestow on them scientific names that ignore the horticultural status of the clon. This situation and the confusion that can arise from it may be illustrated by a consideration of the Balm-of-Gilead Poplar.

The Balm-of-Gilead Poplar

The poplar widely known and cultivated in America and Europe under the common names "Balm-of-Gilead" and "Ontario Poplar" exists only as a female tree. It has always been propagated exclusively by cuttings and by sprouts that arise from the roots. The evidence seems to be conclusive that all the trees of this Balm-of-Gilead Poplar have been derived from one indi-

vidual seedling by repeated vegetative propagation. Such a group of plants constitutes a *clon,* which is to be distinguished from a species or a variety that is reproduced true to type by seeds. In considering the botanical status of the Balm-of-Gilead Poplar, it is necessary, therefore, to determine whether this clon represents or belongs with a species or a variety, or whether the original seedling was different from any wild type and may even have been a hybrid.

It seems that the first specific mention of this particular type of poplar is by Aiton in 1789 (Hortus Kewensis 3: 406). Aiton states that he was describing the " Heart-leaved Tacamahac Poplar," native of Canada and introduced into England by John Hope about 1772. Aiton, however, decided that these plants were sufficiently different from the type of the species *P. Tacamahacca,* which he listed under the name *P balsamifera,* to be considered as a distinct species and so he bestowed on them the specific name *P candicans.* In doing this he evidently assumed that the trees which he had were representative of a type more or less abundant in the wild in America. Since he described both male and female flowers he undoubtedly had at least two different trees for the description.

In tracing the plants named by Aiton back to Hope, one finds that in his catalog (Catalogus Arborum et Fruticum) of plants growing in the Royal Botanic Garden in Edinburgh, which was published in 1778, Hope lists *"P tacamahac,"* using the name given by Miller in 1768 (Gardeners Dictionary, 8th Edition). Thus it appears certain that Aiton gave the specific name of *P. candicans* to plants which Hope listed as *P. Tacamahac,* but which differed from the type of this species in having leaves that were more heart-shaped.

Exact information seems to be lacking as to whether the plant which gave rise to the clon now called Balm-of-Gilead Poplar was one of the trees which grew at the Royal Botanic Garden in Edinburgh or was a tree that was obtained elsewhere. At any rate, according to Michaux (Hist. Arb. Forest. Amér. Sept. 1810) the type was already in cultivation in Rhode Island, Massachusetts, and New Hampshire in 1810. Michaux describes the tree under the name *P candicans,* and states that he had never observed it growing wild.

According to Rehder (Manual of Cultivated Trees, 1927) the plant which was later called *P. candicans* was in cultivation before 1755. But this view is evidently based on the mention by Duhamel (Traité des Arbres et Arbustres 2: 181. 1755) of a poplar commonly called "Liard," which grew about Quebec, and on the opinion of Henry (Trees of Great Britain and Ireland, by H. J. Elwes and A. Henry) that the tree thus mentioned could be considered as the *P candicans.* The meager description by Duhamel indicates that he was referring to a Tacamahac Poplar but there is no mention of heart-shaped leaves or that the tree was in cultivation.

The Balsam Poplar or Tacamahac has long been a well-known tree of northern United States and of Canada. The scientific name *P. Tacamahacca* given to it by Miller in 1768 was rejected by the earlier botanists of America in the belief that Linnaeus had previously (1753) given to this species the name *Populus balsamifera.* But it is now certain that Linnaeus really bestowed this name on the Necklace Poplar or Cottonwood. This fact was pointed out by Farwell (Rhodora 21: 101. My 1919) and this view was fully accepted by Sargent (Jour. Arnold Arb. 1: 62. Jl 1919). Thus it is evident that the names given at the present time in many manuals and in other botanical treatises to these two poplars are incorrect. The correct name for the Necklace Poplar or Cottonwood is *P. balsamifera* L., and that for the northern form of it which grows in New York is *P. balsamifera* var. *virginiana* Sargent. Likewise the proper name to use for the Balsam Poplar or Tacamahac is *P. Tacamahacca* Miller. These names will be used in this article unless other names are used in quoting various authors.

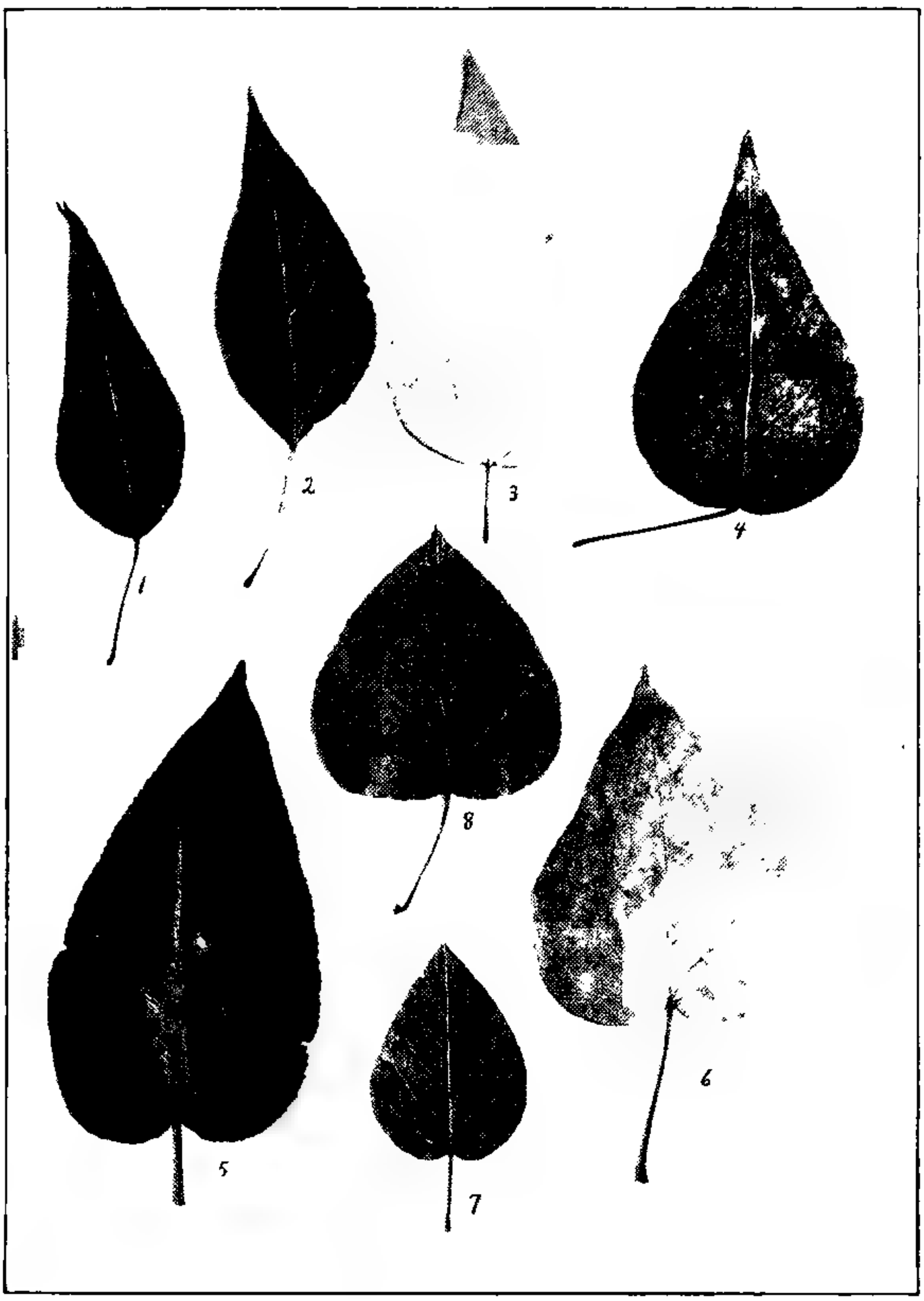
The view that the Balm-of-Gilead Poplar constitutes a species distinct from the Tacamahac was questioned about 1850. At least since the publication in 1856 of the second edition of Gray's Manual various authorities have considered that this form is merely a variety of the Tacamahac. In more recent editions of Gray's Manual, the Balm-of-Gilead Poplar has been restored to specific rank and in certain other publications this same treatment is seen.

But recently it has been found that the exact duplicate of the cultivated Balm-of-Gilead Poplar does not exist in the wild as

was formerly assumed. There are, it is true, frequent statements in botanical literature to the effect that trees of this poplar are to be found growing wild in America and in several instances both the staminate and the pistillate flowers of it are mentioned or even illustrated. But it is now very generally recognized that these statements refer to variations of the wild Tacamahac that are somewhat similar to the Balm-of-Gilead Poplar that is in cultivation.

It has long been known that the species *P Tacamahacca* is somewhat variable in respect to the shape of the leaves. One student of the genus *Populus* decided that the wild members of this species which have heart-shaped leaves should be considered as a distinct species which he designated *Populus Michauxii* Dode (Extr. Monog. Inéd. Populus, 62. 1905). But Henry (Gard. Chr. III. 59: 230. 1916) and Sargent (Jour. Arnold Arb. 1: 61. 1919) have considered that this type should be considered merely as a variety of *P. Tacamahacca*. Sargent says of it: "This is a common northern variety with cordate or subcordate leaves slightly pilose on the underside of the midribs and veins, and distributed from Aroostook County, Maine, to the Province of Quebec, Newfoundland, and the shores of Hudson Bay." In 1883, Macoun (Catalogue of Canadian Plants) in speaking of this form of the Tacamahac says: "In Ontario this variety seems to be the prevailing form, if the hairy petiole and veins of the upper surface of the leaf constitute, with the heart-shaped, long-pointed leaves, the separating characters." Thus there is some reason to consider that the original seedling from which the clon Balm-of-Gilead Poplar was derived was a wild plant of this group. Either this is the case or the original plant was a hybrid between the Heart-leaved Tacamahac and some other poplar, but of this there is no good evidence. Seedlings of the Balm-of-Gilead obtained from cross-pollinations with other poplars are now being grown and these will be studied for evidence on this matter.

It is recorded by Aiton that he was bestowing the scientific name *Populus candicans* to trees of the Heart-leaved Tacamahac obtained from Canada for the Royal Botanic Garden in Edinburgh. Since Aiton had plants of both sexes he had at least two individual plants or plants derived from two different seedlings. This, it would seem, clearly indicates that the name *candicans*



EXPLANATION OF FIGURES 1–8. Nos. 1 to 7 are leaves of wild trees of *Populus Tacamahacca* Miller. Nos. 1, 2, and 3 are from Montana; 4 is from near Field, B. C., in the Canadian Rockies; 5 is from Presque Isle, and 6 is from along the St. John River in Aroostook County, Maine; 7 is from Hudson Bay, Canada. No. 8 is from a tree of the Balm-of-Gilead Poplar in cultivation.

The leaf No. 5 is from a sucker growth in a nursery but all others are from the slow-growing end twigs of rather mature trees. Nos. 5, 6, and 7 illustrate the Heart-leaved Tacamahac (*P. Tacamahacca* var. *candicans*), as it occurs wild in the eastern range of the species.

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should be used as a varietal name for the heart-leaved form growing wild in Canada and northeastern United States rather than the name *Michauxii* bestowed by Dode one hundred and sixteen years later, unless there are two distinct wild forms, as Dode considered to be the case. But only one plant, a pistillate one, has been propagated to give the group of plants now called the Balm-of-Gilead Poplar, which of itself merely constitutes a clon. Although this particular type of plant is not exactly duplicated by wild plants, it is very similar to some of them.

It may be mentioned that in various localities in America there is opportunity for natural crossing between plants of the Balm-of-Gilead Poplar and wild plants of the Tacamahac. In the outskirts of Presque Isle, Maine, there is a group of several trees of the Balm-of-Gilead Poplar planted about the year 1861. At a short distance from these trees there is a grove of wild Tacamahac and near at hand along the street there is a row of trees about twenty-five years old, mostly of the Tacamahac but including at least one tree that is evidently a Balm-of-Gilead Poplar or a seedling of it. Here there is abundant opportunity for seed production of the Balm-of-Gilead trees to cross-pollination, and also opportunity for the seedlings from such seed to become established in the neighborhood. But such conditions as these do not account for the natural and the rather wide distribution in nature of the heart-leaved type of the Tacamahac.

Turning the attention to the history of the use of the common name " Balm-of-Gilead," it is to be noted that it was first applied to the Balsam Fir (*Abies balsamea*). It was so used by Michaux as early as 1810 (Hist. Arb. Forest. Amér. Sept.) but the spelling was " Balsam-of-Gilead." This application has been continued in more or less general use until the present time although about 1843 (Gray, Manual of Botany) the spelling was changed to " Balm-of-Gilead."

Evidently the first appearance in botanical literature of the name " Balm-of-Gilead " in connection with a poplar is in Eaton's " Manual of Botany " published in 1817, but here the name is applied to *P angulata,* which is a Cotton-wood, and not to the *P candicans* of Aiton. This usage is continued by Eaton throughout the eight editions of his Manual, the last of which appeared in 1840. Eaton lists *P candicans* but gives to it no common

name. Torrey in 1826 (Comp. Flora of Northern and Middle States) lists *P. candicans* but gives to it no common name, but later (Nat. Hist. N. Y., vol. 2, 1843) he gives to it the common name " Heart-leaved Balsam Poplar."

It appears that the *P. candicans* Ait. was first listed with the common name Balm-of-Gilead by Beck in 1833 (Botany of Northern and Middle States). The scientific and the common names employed by Wood in 1855 (A Class Book of Botany) for the poplars of interest in this discussion are as follows: *Populus candicans* Ait., Balm-of-Gilead; *P angulata,* Water Poplar, Western Cotton Tree; *P. monilifera,* Necklace Poplar; and *P. balsamifera,* Balsam Poplar. The names given by Gray in 1848 and thereafter (Manual of the Botany of Northern U. S.) are *P. candicans* Ait., Balm-of-Gilead, and *P. angulata* Angled Cotton-wood. Thus in botanical literature the common name Balm-of-Gilead was transferred from the Cottonwood to the clon derived from a tree that had retained the botanical name *P. candicans* and this usage has been very generally followed since.

But the names " Balm Poplar," " Balsam Poplar," and "Balm-of-Gilead " are sometimes applied at the present time to trees of the Necklace Poplar or Cottonwood (*P balsamifera* var. *virginiana* Sargent). The name Balmville has for many years been employed to designate a village located a short distance from Newburgh, N. Y., the name being applied on account of a large " Balm Poplar " that stands within the village. " The Scythe Tree " of historic associations, growing near Waterloo, N. Y., is locally known as a Balm-of-Gilead. A calendar for the year 1928, illustrating twelve " Historical Trees of New York State," published by The Federated Garden Clubs of New York, shows a picture of " The Scythe Tree " and calls it a Balm-of-Gilead, and it also shows a picture of the " General Lafayette Tree " which is growing near Geneva, N. Y., and calls it a " Balsam Poplar." All these trees are typical specimens of the northern form of the Necklace Poplar or Cottonwood, which is rather frequently seen along the lakes and the streams in the region about Geneva and Waterloo, and along the canal between these two cities. In fact numerous wild trees of this poplar are growing within short distances from " The Scythe Tree " and " The General Lafayette Tree." This type of poplar is very distinct from the Balsam

Poplar and the Balm-of-Gilead Poplar as these names have very generally been applied since about 1850, and the two historical trees just mentioned should, therefore, be called by the name Necklace Poplar.

The consideration of the Balm-of-Gilead Poplar and of its wild relatives clearly illustrates the relation of the horticultural clon to the species and the variety as these occur in nature.

There is the species *Populus Tacamahacca* Miller, commonly called Balsam Poplar or Tacamahac, which for more than one hundred years was, it now seems, wrongly called *P. balsamifera.* The Tacamahac is a well-known species growing naturally from northern New England to Minnesota, and north and westward. It has large buds that are copiously covered with a fragrant resin, and its leaves are typically ovate-lanceolate with a white waxy surface beneath. In the eastern portion of the range of this type of poplar, trees with leaves more or less heart shaped are frequent, and in some localities they predominate. This form should be known as *Populus Tacamahacca* var. *candicans,* which name replaces and includes the names *P. candicans* Aiton, *P. Michauxii* Dode, *P balsamifera* var. *candicans* A. Gray, and *P balsamifera* var. *Michauxii* Henry. This form has been known as the Heart-leaved Tacamahac since an early date.

A single pistillate tree, evidently of the Heart-leaved Tacamahac or a hybrid of this poplar, has been propagated, distributed by nurserymen, and widely planted as an ornamental tree in Europe and America. This tree differed but slightly from various of its sister plants. Possibly its leaves are slightly more heart-shaped than is the rule. The individual characteristics of this plant have been carried by vegetative propagations into the many trees of this clon now called the Balm-of-Gilead Poplar. This clon is obviously closely related to the wild variety, yet it possesses some individual qualities that warrant a special horticultural name. Thus we may recognize that in nature there are many trees of the Heart-leaved Tacamahac which collectively constitute a variety that can be designated in scientific nomenclature as *Populus Tacamahacca* var. *candicans*, and that one seedling of this variety possessing more or less individual character has been propagated asexually to give many plants which may be designated as the clon Balm-of-Gilead Poplar.

Discussion

In considering the status of the members of a clon the precise conception of the term "plant" is in question. In respect to stature, completeness of parts, function, and place in the garden or orchard, the individual member of the clon is a plant except when the propagation is by grafting. But in the higher plants, which we are here considering, the members of a clon arise from the vegetative propagation of one *seedling plant* or from a distinctive bud sport. For them there is the most complete identity possible among the higher plants and in this the members of a clon differ from a group of plants grown from seed that is produced by sexual reproduction. To indicate this difference it is here suggested that the word "ramet" (from the Latin *ramus* meaning branch) be used for a member of the clon. To indicate the original seedling plant from which the clon is derived the word *ortet* (from the Latin *ortus* meaning origin) may be used.

The botanical status of the entire group of plants (ramets) constituting a clon is precisely that of the individual plant (the ortet) from which the clon was derived. The clon may represent a species and be typical of many plants of this species. It may belong with the plants of a variety, but if this variety is somewhat variable it may be a rather extreme type. But a clon may also be derived from a hybrid plant or by a long period of selective breeding and in fact most clons of the perennials used in horticulture have such an origin and hence have no claim to specific or varietal rank.

The horticultural status of the clon is merely that of a group of plants of use in horticulture that are continually propagated in a vegetative way. This gives a uniformity of type which preserves the individual character and the outstanding qualities which made the original seedling of horticultural value. The clon is hence an individual plant that has been extended into a large number of divisions or ramets.

In the naming of a clon it would seem that its horticultural status should be given full consideration. In most cases among horticultural plants of complex origin this is done and the clon is known as the Baldwin Apple, the Concord Grape, the Ambassadeur Iris, the Sovereign Daylily, etc. However, at the present time the group of plants constituting a clon is usually called a

"variety." This term has a very different significance in its application to wild varieties or to varieties of agricultural and vegetable crops that are grown from seed, breed true to seed, and in which each plant is a different seedling. It would be more accurate and discriminating to use the term "clon," when it is applicable, instead of the term "variety."

The use of the term "clon" in the manner here employed was suggested by Dr. Herbert J. Webber twenty-six years ago (Science, II. 18: 501–503. 1903) and its application in horticulture and in plant breeding has been very clearly stated in various publications. But the horticultural literature of the present time is decidedly negligent as to recognizing the nature of the clon and its significance as a horticultural unit, and so naming it that it may be clearly distinguished from the species or the variety that is repeatedly grown from seeds. A recent volume on "Standardized Plant Names," which is the work of an American Committee on Horticultural Nomenclature, may be cited in this particular. This volume discusses the problems of naming cultivated plants, considers the "scientific" and the "common" names used for them, and recommends that "individual non-Latinized" names be used for "all horticultural hybrids and other horticultural varieties." But nowhere in the volume is the word *clon* used, nor is the conception and the status of the clon as a horticultural unit recognized or stated. Some of the errors in this volume in regard to the treatment of clons as species or as varieties may be illustrated from the nomenclature recommended for poplars and daylilies. (1) The name *Populus candicans* is used, thereby giving to the Balm-of-Gilead Poplar clon a specific rank; (2) the name *Populus Bolleana* is given for a clon of *P alba* of pyramidal habit of growth; (3) the species name *Populus robusta* is given to a clon of known hybrid origin; (4) for a clon of daylily known to be a hybrid the name *Hemerocallis luteola* is used; and (5) the name *Hemerocallis aurantiaca major* is given to a clon that has been derived from a single seedling of unknown parentage. Such errors are due chiefly to the fact that the fundamental nature of the horticultural clon was not clearly in mind.

The clon is in its essential nature merely one single plant. In its origin and nature it is the smallest and the most individual

unit in horticulture. Its botanical status is no more than that of a single seedling plant that is not propagated vegetatively. Its status remains thus even after the clon becomes widely cultivated and exists as many ramets. There is no excuse for confusing the clon with a species or even with a variety and of naming it in the same manner. The special and individual nature of the clon merely requires a non-Latinized horticultural name that in its usage approaches the rank of a proper noun. When there is a close relation to a species or a variety the clonal name may be written in connection with the proper scientific name; as for example *Populus alba* clon Bolleana. In case the specific relationship is remote or involved, the cultivated clon may be merely named the Baldwin Apple, the Ambassadeur Iris, etc., with the idea clearly in mind that the name refers to a clon. With such treatment the clon will be accorded its due rank as a minor and a special unit of plant life of a lower category than the species or the variety, either wild or cultivated.

II. The Clon as a Natural Unit in Plant Life

In the discussion above, the emphasis has been directed to the flowering plants and perhaps also to the ferns that are used in horticulture, and the system of nomenclature suggested is applied especially to this class of plants. But the clon exists as an important natural unit in many kinds of plants not only among the "flowering" plants but also among the "flowerless" plants. In fact, as the scale of plant life descends, asexual reproduction becomes of increasing importance and the clon becomes likewise more conspicuous as a natural unit of life.

The scope of asexual reproduction and the prevalence of the clon in the plant kingdom may be indicated by the following general survey:

1. The horticultural propagation of flowering plants by budding and by grafting is the most strictly artificial method of asexual reproduction known. In this case the trunk and the top grown from a bud or a scion is the ramet portion that is made to live on a root system of another plant.

2. The propagation of flowering plants by roots, bulbs, division of the crown of the plant, runners, rhizomes, cuttings, etc., produces clons not only in horticultural practice but in nature. In

fact many of these methods occur regularly in nature, giving clons of large size. In some cases the entire so-called species (for example, *Lilium tigrinum*) exists only as a single clon.

3. Reproduction by seeds gives a clon when the seeds of a plant are produced apogamously; i. e., without true fertilization. In such cases the seeds are merely buds that are produced internally and the entire offspring of apparent seedlings constitute a clon.

4. In the flowerless plants that are multicellular in nature, some of the natural means of asexual reproduction which give clons may be cited as follows:—spread of a rhizome system as in ferns, budding and gemmae formation in mosses and liverworts, spread by growth of a thallus in liverworts and algae, spread by growth of a mycelium as in fungi, and reproduction by conidia in many fungi. Thus the repeated propagation by such means as these may give clons of large extent. Such clons are of special significance as biological units, especially in the so-called + and – relations that exist in regard to the determination of the course of sexual reproduction, and in respect to the frequency with which hybridization may occur in fungi, the possibility of which was first shown by Dodge (Jour. Agric. Research **36**: No. 1. 1928). Here, we may note, the clon becomes a unit in the gametophytic or haploid stage of the plant cycle quite as it is a unit in the sporophytic or diploid stage in the higher plants.

5. In the lowest forms of plant life, which are unicellular or chiefly so, the repeated cell division leads to the development of clons often of large extent. The continuation of these is broken only when there is fertilization but this is apparently rare or even lacking in various types, such as the bacteria. And thus strains, races, or even so-called species of various of the lower organisms may exist largely or even entirely as single clons.

It is to be recognized that in any kind of plant and in the gametophytic as well as in the sporophytic generation a new clon may arise from an older clon by vegetative or somatic variation, such as is well illustrated by the "bud sports" of the flowering plants and the ferns. Also in various fungi, especially of those with homothallic (bisexual) mycelium, either of species like *Neurospora tetrasperma* or of hybrids between species of fungi, certain conidia may be unisexual while others are bisexual and thus different clons of fungi may arise from the conidia of a single

mycelium. The possibilities of this condition and its significance in the studies of cultures of certain fungi are well shown by Dodge (Mycologia **20**: 226–234. 1928). The distinctive character of such new clons gives to them an individual identity. Undoubtedly much remains to be learned about somatic variation in clons of lower forms of plant life where there is asexual reproduction by such spores as conidia.

The clon is therefore to be recognized as an important natural unit of special significance in the description and naming of plants of all sorts, in the consideration of the relationships within and between groups of plants, and in the special studies of the physiology of the lower organisms, and of their relations in pathology.

A. B. STOUT.

A GIANT ORCHID IN BLOOM

Orchids are usually valued for their beauty and delicacy, but some of those now in bloom at The New York Botanical Garden are truly giants, growing on stalks over five feet high and with ten to fifteen large blooms on each stalk. These are the St. Joseph's-wand (*Laelia superbiens*), given to the Garden last year by Miss Mary T. Cockroft, of Saugatuck, Connecticut. They were large plants when they came to the Garden and have grown vigorously since. The flowers are orchid-purple in color, with yellow lip.

Many other orchids are in bloom in the Orchid House of Conservatory Range 2, on the east side of the Garden, north of the Allerton Avenue entrance. The lady's-slippers are still full of flowers, some of which have been open for two weeks or longer. Many kinds of orchid flowers will last on the plant for fully a month. Among the interesting forms are the Coleogynes, on which the pink-throated white flowers are borne during the dormant season, when the plants are simply groups of green aerial bulbs.

Dozens of the curious little orchids are also blossoming. All have flowers of strange shapes and markings. Each is adapted to pollination by a different kind of insect, and their unusual forms and structures carefully provide that the flowers be fertilized by pollen from other flowers, not from their own. Such

cross-pollination, as it is called, produces more vigorous seed and seedlings than if each flower were fertilized by its own pollen. Adaptation has gone so far in most of the orchids that they cannot set seed to their own pollen. One strange group, the Catasetums, has two trigger-like antennae in each flower. If these are touched, the pollen masses, each with a sticky base, are thrown forcibly out of the flower, and will stick tightly to the back of the insect visitor, there to be carried to another flower. Two of these Catasetums are now flowering in the Orchid House. Their blooms are more curious than beautiful, being shaped like serpents' heads with wide-open mouths, dull purplish-brown and yellow in color; but like most of the orchids, their strange habits make them interesting. Indeed, the orchids as a group have not generally either handsome or showy flowers. The imposing florists' type of orchids are the exceptions rather than the rule in the orchid family, most of the members of which have small and inconspicuous flowers.

A few of the large orchids—Laelias, Cattleyas, Lady's-Slippers, Coelogynes, and Dendrobiums—are beginning to bloom. The big display of orchids is due to come next month, but some of the most interesting, like the giant Laelias, are now (January) in bloom.

FORMAN T. MCLEAN.

THE AQUATIC HOUSE

During the summer of 1928, the Aquatic or Tank House, No. 9, of our Conservatory No. 1, was repaired. During the season the large collection of plants was kept in the tender water-lily tank, and upon completion of repairs to the house it was returned. New tubs or new receptacles and new soil were furnished and the whole replanted. FIGURE 9 is a photograph of the newly occupied house.

As usual, the surface of the water is subject to domination by four groups, namely the water-hyacinth, the azure water-hyacinth, the water-poppy, and the parrot's feather. Two or three types of tender water-lilies are found in this house, together with some of the new varieties such as Dr. Frederic S. Lee and Prof. Robert A. Harper, originated by Mr. H. W. Becker.

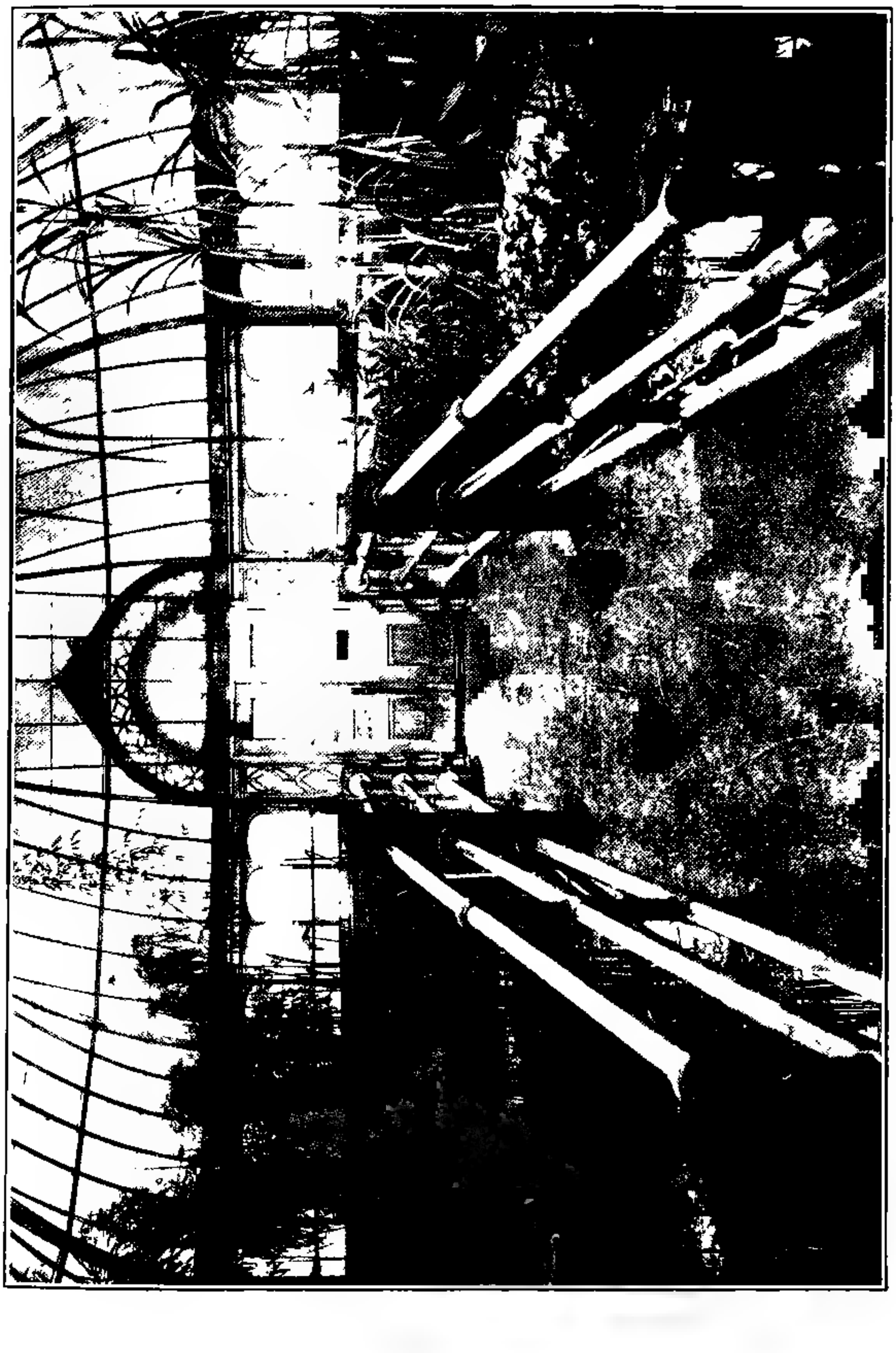

FIGURE 9. Interior of the Aquatic House, Conservatory Range No. 1.

Among the plants rising robustly above the water are the Thalias, the green one and the mealy one, both from Florida; the pickerel-weeds, represented by the species indigenous to Montevideo, and the Limnocharis, a yellow-flowered plant with curious three-cornered petioles. Papyrus, the Egyptian paper plant, is the most popular plant in this house, the most in demand by schools and churches.

The flat, surface covering plants typical here are the floating-heart, from Europe and North Asia; the water-poppy, from Brazil; and the water-snowflake, the present specimens of which were brought from Porto Rico by Dr. N. L. Britton. Another surface plant which has to be restrained is the Salvinia, a fern-wort, kept in the confines of a tub.

Two plants best grown in very slightly submerged soil, but themselves in the air, are the water-lettuce and the floating fern, found in pans hanging from the pipe-rail. The former is an aroid, though looking little like one; the latter is the only true aquatic among real ferns and produces buds and young plants on the leaves.

House No. 9 is open daily from 10:00 A. M. to 4:00 P. M. and is in charge of Mr. John Sommer, an expert in aquatics. Mr. Sommer has cared for this house for eighteen years; during that time it has been visited by many thousands. It is especially pleasant during the winter months.

KENNETH R. BOYNTON.

THE NORTH AMERICAN CUP–FUNGI

(OPERCULATES)

The above work, an advance notice of which appeared in the July-August number of *Mycologia,* was issued December 30, 1928. The volume is somewhat larger than predicted, comprising more than two hundred and ninety pages of text and forty-six plates, two of which are in color, the remainder consisting of halftones and drawings or combinations of both.

Of the two hundred and eighty valid species recorded in this monograph, more than one hundred are illustrated, eighteen of

which are in color. Accompanying each species is a complete list of synonyms, which, with the diagnosis, represents the author's version of the species, based on the information at present available. In addition to the valid species, notes on a large number of doubtful forms are appended after the genus in which they would appear to belong. For the first time there is brought together under one cover a complete record of our knowledge of the operculate cup-fungi occurring in North America. While the work is essentially North American, the plants of this group are so cosmopolitan that the majority of the forms will be found in almost any other part of the world where we have the same diversity of conditions.

The author wishes here to announce his intention of continuing the study, not only of the operculate forms but of the inoperculate as well, with the hope of publishing a similar volume on the latter or possibly a combination of the two, provided the demand for the present work seems to warrant it. To this end, material and original photographs are solicited from collectors in other parts of the world.

The book is printed on the same grade of paper and in the same general style employed in *Mycologia,* and is bound in "Vellum de Lux " cloth, and is published entirely at the expense of the author. The price of the volume is five dollars plus twenty-five cents for postage and mailing. More detailed information may be obtained by addressing the author at The New York Botanical Garden.

FRED J. SEAVER.

WINTER GARDENING LECTURES

During January and February, 1919, free lectures and demonstrations are given in the Central Display Greenhouse, Conservatory Range 2, on Saturdays at 3:00 P. M., as follows:

January 5. "Some Garden Birds and Their Foods," Mr. R. S. Williams, Administrative Assistant.

January 12. "Conservatory Plants," Mr. Kenneth R. Boynton, Head Gardener.

January 19. "Amateur Greenhouses," Mr. T. H. Everett, Head Gardener at the Manville Estate, Pleasantville.

January 26. "House Plants and Their Care," Mr. H. W. Becker, Foreman of Greenhouses.

February 2. "Variegated Plants," Dr. A. B. Stout, Director of Laboratories.

February 9. "Greenhouse Diseases and Pests," Dr. B. O. Dodge, Plant Pathologist.

February 16. "Tropical Air Plants," Dr. Forman T. McLean, Supervisor of Public Education.

February 23. "Planting Flower Seeds," Mr. George Friedhof, Foreman of the Propagating House.

NOTES, NEWS, AND COMMENT

Dr. Arthur Hollick represented the Botanical Garden at the official opening of the Buffalo Museum of Science on January 19. This new museum building, made of Indiana limestone, was made possible by a public referendum ordered by the Common Council of Buffalo in 1923, authorizing the erection of a building at a cost not to exceed $1,000,000.

The regular monthly conference of Scientific Staff and Registered Students of the Garden was held on the afternoon of December 12. At this conference the program was as follows:

"Studies of the Flora of Northern South America," by Dr. H. A. Gleason.

"The Pollen Grain of *Rhododendron* and *Azalea*," by Mr. Clement G. Bowers.

The publication of these studies in detail is expected in the near future.

The Chrysanthemum is the subject of a recent bulletin of the Agricultural Experiment Station at Michigan State College. This Special Bulletin No. 186 is written by a friend of The New York Botanical Garden, Mr. Elmer D. Smith, of Adrian, Michigan, in collaboration with Prof. Alex. Laurie, of Michigan State College. In this discussion of "Chrysanthemum Breeding," Mr. Smith includes a list of the hundreds of varieties originated and disseminated by his company since 1890, with the parentage of each, so those who have studied the fine collection of these

varieties which Mr. Smith has given to the Garden from time to time will be able now to find out the parentage of many attractive sorts.

At the meetings of the Botanical Society of America held in New York City during the recent holidays, Professor Margaret C. Ferguson, of Wellesley College, was elected President for the ensuing year; for Section G (Botany) of the American Association for the Advancement of Science, Professor J. Arthur Harris, of the University of Minnesota, is the new chairman (and Vice-president of the A. A. A. S.); of the American Phytopathological Society, the new President is Dr. R. J. Haskell, of the Bureau of Plant Industry, U. S. Department of Agriculture; of the Mycological Section of the Botanical Society of America, the chairman for the current year is Dr. C. W. Dodge, of Harvard University; and of the Sullivant Moss Society, Mr. R. S. Williams, of The New York Botanical Garden, who has been its President for five years, was reëlected.

Having proved a most useful ornamental plant, the Creeping Nettle should be brought to the attention of the thousands of small householders in the city who appreciate a bit of growing greenery in homes. Although native to the sea-washed rocks and banks of the coasts of Corsica and Sardinia, when brought into cultivation this little mat-plant took up the somewhat lowly life of ground cover under greenhouse benches. Another way of serving the gardener is by carpeting the greenhouse rockery. In mild climates the Creeping Nettle is a most excellent rock-garden subject and in our locality it can be used for that purpose if protected very well or if a bit is taken indoors during the winter to serve as stock for next year's plantings. Hundreds of rapidly creeping stems cover the soil in all directions, making a mat of rich green. Boxes, pots, and pans can be quickly covered with green by this plant, which, despite its humble character, attracts much attention by its usefulness. The slender zig-zag stems have roots at every inch or so, and a very small piece, planted in the top of the rubber-plant pot, will serve as a beginning. Any place with a little light, no frost, and opportunity for fairly constant watering, will be sufficient to grow the creeping nettle. Even the

scientific name of this little carpeter is attractive—*Helxine*—from a Greek base similar to that of *Helix*, the ivy, translated by one authority as "I cling and twine."—*Forman T. McLean.*

The best way to learn about woodlands is to study the woods themselves. Nearly half of the area of The New York Botanical Garden is covered with original forest, which offers an excellent opportunity for the study of the life and development of the forest. Accordingly, Dr. Forman T. McLean, Supervisor of Public Education, has arranged to hold a series of five out-door meetings, beginning on Saturday, February 2, at 2 P. M. The party will meet at the entrance to the Central Display Greenhouse, Conservatory Range 2. This is immediately north of the Allerton Avenue entrance on the east side of the Garden. One hour will be spent in a walk through the forest, then an opportunity will be offered for the visitors to attend the Saturday afternoon gardening talks at the Central Display Greenhouse, after which another short excursion through the forest may be made if desired. These trips will be continued each Saturday afternoon during February and the first week in March. The plan is not to teach the art of forestry, but to show the life activities of the forest itself. Accordingly there will be opportunity to learn about the real basis for forestry rather than about its practical operations. Not only do the individual forest trees have characters and peculiarities similar to those of human beings, but also the forest as a whole passes through life phases from youth to old age, and the health of the forest is just as dependent on the proper functioning of trees, shrubs, and other living things that compose it as we are upon good health of our lungs, heart, and other organs. The members of the Torrey Botanical Club and of the different hiking and trail clubs of New York City are being invited to participate in these trips.

ACCESSIONS

BOOKS FROM THE LIBRARY OF DR. JOHN H. BARNHART PURCHASED 1926 (CONTINUED)

[Howe, W. E.] *The ferns of Derbyshire illustrated from nature, with a preface by the Rev. Gerard Smith.* New edition with additions. London, [1877].

Ramis y Ramis, Juan. *Specimen animalium, vegetabilium, et mineralium in insula Minorca frequentiorum ad normam Linnaeani sistematis, exaratum.* Magone Balearum, 1814.

[Rich, Obadiah.] *A synopsis of the genera of American plants.* Georgetown, 1814.

Saccardo, Pier' Andrea. *Breve illustrazione delle crittogame vascolari trivigiane, aggiuntavi l' enumerazione di quelle fino ad oggi note nella flora veneta.* Venezia, 1868.

Saint-Hilaire, Augustin François César Prouvençal de. *Tableau de la végétation primitive dans la province de Minas Geraës.* [Paris,] 1831.

———. *Voyage dans les provinces de Rio de Janeiro et de Minas Geraës.* 2 vols. Paris, 1830.

———. *Voyage dans le district des diamans et sur le littoral du Brésil.* 2 vols. Paris, 1833.

Salm-Reifferscheid-Dyck, Joseph Franz Maria Anton Hubert Ignatz von. *Cacteae in Horto Dyckensi cultae. Anno 1841.* Dusseldorpii, 1841.

Sandford, E. *A manual of exotic ferns & Selaginella.* London, [1882.]

Santi, Giorgio. *Viaggio al Montamiata.* Pisa, 1795.

———. *Voyage au Montamiata et dans le Siennois.* Vol. 2. Lyon, 1802.

Sargent, Charles Sprague. *Woods of the United States with an account of their structures, qualities, and uses.* New York, 1885.

Saussure, Nicolas Théodore de. *Chemische Untersuchungen über die Vegetation.* Translated by A. Wieler. 2 vols. Leipzig, 1890.

Schaefer, Johannes Bernhard. *Beitrag zur Entwicklungsgeschichte des Fruchtknotens und der Placenten.* Marburg, 1889.

Schaeffer, Jacob Christian. *Epistola de studii botanici faciliori ac tutiori methodo.* [Ratisbonae, 1758.]

———. *Erleichterte Arzneykräuter-wissenschaft.* New ed. Regensburg, 1773.

Scheuchzer, Johann Jakob. *Operis agrostographici idea; seu, Graminum, Juncorum, Cyperorum, Cyperoidum, iisque affinium methodus.* Tiguri, 1718.

Schibler, Wilhelm. *Beiträge zu einer vergleichend-systematischen Anatomie des Blattes und Stengels der Boragineen.* Bern, 1887.

SCHKUHR, CHRISTIAN. *Deutschlands kryptogamische Gewächse; oder, vier und zwanzigste Pflanzenklasse nach dem Linnéischen System.* Heft 1 & 2. Wittenberg, 1804–05.

SCHLEIDEN, MATTHIAS JACOB. *De notione folii et caulis.* Jenae, 1849.

SCHLEPEGRELL, GUSTAV VON. *Beiträge zur vergleichenden Anatomie der Tubifloren.* Cassel, 1892.

SCHOEPF, JOHANN DAVID. *Travels in the Confederation [1783]–1784.* Translated and edited by Alfred J. Morrison. 2 Vols. Philadelphia, 1911.

SCHÜBLER, GUSTAV. *Untersuchungen über das specifische Gewicht der Samen.* Tübingen, 1826.

SCHULTZ, CARL HEINRICH (BIPONTINUS), & SCHULTZ, FRIEDRICH WILHELM. *Commentationes botanicae.* Neapoli, Nementum, 1859.

SCHULTZE, MAXIMILIAN JOHANN SIEGMUND. *Das Protoplasma der Rhizopoden und der Pflanzenzellen.* Leipzig, 1863.

SCHWÄGRICHEN, CHRISTIAN FRIEDRICH. *Topographiae botanicae et entomologicae lipsiensis specimen primum.* Lipsiae, 1799.

———. *Topographiae botanicae lipsiensis specimen secundum.* Lipsiae, 1799.

———. *Topographiae botanicae lipsiensis specimen 3–5.* Lipsiae, 1804–1819.

SCHWANN, THEODOR. *Mikroskopische Untersuchungen über die Uebereinstimmung in der Struktur und dem Wachstume der Tiere und Pflanzen.* Leipzig, 1910.

SCHWARZENTRAUB, CHRISTIAN. *Die Pflanzenwelt in den alt-französischen Karlsepen. 1. Die Bäume.* Marburg, 1890.

SCOFFERN, JOHN. *Outlines of botany.* London, [1857].

SCOPOLI, JOHANN ANTON. *Introductio ad historiam naturalem.* Pragae, 1777.

SCORESBY, WILLIAM, JR. *Journal of a voyage to the northern whale-fishery, including researches and discoveries on the eastern coast of West Greenland, made in . . . 1822, in the ship Baffin.* Edinburgh, 1823.

SCUDDER, SAMUEL HUBBARD. *Catalogue of scientific serials of all countries, including the transactions of learned societies in the natural, physical and mathematical sciences, 1633–1876.* Cambridge, 1879.

SEIDEMANN, GUSTAV ADOLPH. *Versuche über den Einfluss der künstlichen Electricität auf des Wachsthum der Pflanzen.* Zittau, 1839.

SHERRY, CHRISTOPHER. *The Glasgow botanic gardens; its conservatories, greenhouses, etc.* Glasgow, n. d.

The Sierra Club bulletin. Vols. 1–5. San Francisco, 1896–1905.

SITGREAVES, LORENZO. *Report of an expedition down the Zuni and Colorado rivers.* Washington, 1853.

SMALL, HENRY BEAUMONT. *Canadian forests; forest trees, timber and forest products.* Montreal, 1884.

SMITH, JAMES EDWARD. *A compendium of the English flora.* London, 1829.

———. *An introduction to physiological and systematical botany. First American from the second English edition, with notes by Jacob Bigelow.* Boston, 1814.

———. ———. Philadelphia, 1814.

———. *An introduction to physiological and systematical botany. New ed. with additions by William Macgillivray.* London, 1836.

———. *An introduction to the study of botany.* Ed. 7, corrected by W. Jackson Hooker. London, 1833.

———. *Flora britannica . . . recudi curavit additis passim adnotatiunculis J. J. Römer.* 3 vols. Turici, 1804–05.

SMITH, JARED GAGE. *Revision of the North American species of Sagittaria and Lophotocarpus.* [St. Louis] 1894.

SMITH, JOHN. *Domestic botany; an exposition of the structure and classification of plants.* London, 1880.

SURINGAR, HUGO. *Untersuchungen über verschiedene Bestimmungsmethoden der Cellulose und über den Gehalt der Baumwolle an Pentosan.* Göttingen, 1896.

SWEET, ROBERT. *The hot house and greenhouse manual; or, botanical cultivator.* Ed. 6. London, 1839.

MUSEUMS AND HERBARIUM

41 specimens of woody plants, mostly from Nicaragua. (By exchange with Yale University.)

279 specimens of flowering plants from Venezuela. (Collected by Mr. Henri Pittier.)

1 specimen of *Remirea maritima* from Brazil. (By exchange with the United States National Museum.)

1 specimen of *Thalesia uniflora* and host from Texas. (Given by Mr. W. A. Bridwell.)

148 specimens of flowering plants from California, Mexico, and Alaska. (By exchange with the California Academy of Sciences.)

98 specimens of flowering plants from the local-flora range. (By exchange with the Brooklyn Botanic Garden.)

2 specimens of *Isotria verticillata* from Staten Island, New York. (Given by Dr. Arthur Hollick.)

1550 specimens of flowering plants from the Marcus E. Jones herbarium. (By exchange with Pomona College.)

1 specimen of fruits of *Diospyros Mosieri* from Florida. (Given by Mr. C. A. Mosier.)

4 specimens of sedges from Long Island, New York. (Given by Mr. W. C. Ferguson.)

35 specimens of flowering plants from the local-flora range. (Given by Dr. H. M. Denslow.)

2 herbarium specimens of *Piptadenia* endemic in Venezuela. (By exchange with Mr. Henri Pittier.)

2 specimens of the fruits of *Chaenomeles sinensis* from the Fruticetum. (Collected by Mr. James Finley.)

250 specimens of flowering plants from Alberta, Canada. (By exchange with Mr. A. H. Brinkman.)

86 specimens of *Hypericum* from Peru. (By exchange with the Field Museum of Natural History.)

176 specimens of flowering plants from Colombia. (By exchange with Mr. R. A. Toro.)

12 specimens of flowering plants from tropical America. (By exchange with the United States National Museum.)

1 specimen of *Stylophyllum anomalum* from California. (By exchange with Dr. Anstruther Davidson.)

75 specimens of lichens from Jamaica, West Indies. (Collected by Dr. W. R. Maxon.)

1 specimen of *Viola palmata* from Florida. (Given by Miss Marie Sanial.)

11 specimens of flowering plants from Panama and Costa Rica. (By exchange with Harvard University.)

50 specimens of grasses from South America. (By exchange with the Bureau of Plant Industry.)

4 photographs of type specimens of *Viburnum*. (By exchange with the United States National Museum.)

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1 specimen of *Pithecolobium Unguis-Cati* from Florida. (Given by Mr. Charles H. Griner.)

1 specimen of *Ivesia Jaegeri* from Nevada. (By exchange with Pomona College.)

2000 specimens of flowerless and flowering plants from Porto Rico. (Collected by Dr. and Mrs. N. L. Britton.)

1200 specimens of flowering plants and ferns from the Gulf States. (Collected by Dr. J. K. Small.)

7000 specimens of flowerless and flowering plants from Colombia. (Collected by Messrs. Killip and Smith.)

1 specimen of the Trinidad orchid, *Epistephium ellipticum*. (By exchange with the Agricultural Experiment Station, Port of Spain, Trinidad.)

2 specimens of flowering plants from Florida. (Given by Mr. W. M. Buswell.)

2 specimens of flowering plants from Central America. (By exchange with Harvard University.)

7 specimens of flowering plants from Missouri and Texas. (By exchange with Mr. E. J. Palmer.)

1 specimen of *Hypopitys insignata* from North Carolina. (By exchange with Dr. F. W. Pennell.)

11 specimens of flowerless plants from Venezuela. (Collected by Mr. Henri Pittier.)

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Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. xvi + 320 pp., with 176 figures. 1903.

Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. xiii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 478 pp., with 73 figures and 14 plates. 1908.

Vol. V. Flora of the Vicinity of New York: A Contribution to Plant Geography, by Norman Taylor. vi + 683 pp., with 9 plates. 1915.

Vol. VI. Papers presented at the Celebration of the Twentieth Anniversary of The New York Botanical Garden. viii + 594 pp., with 43 plates and many text figures. 1916.

Vol. VII. Includes New Myxophyceae from Porto Rico, by N. L. Gardner; The Flower Behavior of Avocados, by A. B. Stout; Descriptions of New Genera and Species of Plants Collected on the Mulford Biological Exploration of the Amazon Valley, 1921–1922, by H. H. Rusby; and The Flora of the Saint Eugene Silts, Kootenay Valley, British Columbia, by Arthur Hollick. viii + 464 pp., with 47 plates, 10 charts, and 11 text-figures. 1927.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. In the thirteenth volume.

THE NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

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Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

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A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

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Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

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The education of school children and the public through the above features and the giving of free information on botanical, horticultural, and forestal subjects.

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Benefactor	single contribution	$25,000
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NEW YORK'S FIRST BOTANICAL GARDEN[1]

The lease of the "Upper Estate" of Columbia University to John D. Rockefeller, Jr., for a term of eighty-seven years at a reputed rental of about $3,000,000 a year has recently directed public attention to the Elgin Botanic Garden, a large part of the original area of which is involved in the present deal. The Elgin Botanic Garden was started in 1801 as a private enterprise by Dr. David Hosack, at that time Professor of Botany and a little later Professor also of Materia Medica in Columbia College. The name Elgin was that of his father's native place in Scotland.

The Bartram Garden, started by John Bartram in 1730 on the west bank of the Schuylkill River, in what is now a part of Philadelphia, is commonly reputed to have been the "first"[2] botanical garden in America, but it was never a public garden in the sense of being owned by city or state until it was acquired by the City of Philadelphia in 1891. The Elgin Botanic Garden, established

[1] For the basic facts in the present article, the writer has relied chiefly on the writings of Dr. David Hosack and on a scholarly paper by the late Judge Addison Brown, entitled "The Elgin Botanical Garden, its Later History, and Relation to Columbia College and the Vermont Land Controversy" (Bull. N. Y. Bot. Gard. 5: 319–372. 1909).

[2] Just what would qualify as a "botanical garden" is a matter of definition and opinion. Professor Harshberger (Botanists of America and Their Work, 43. 1899) is inclined to give the honor of starting "The first botanical garden in America" to Dr. Christopher Watt, of Germantown, whose garden is said to have antedated the more famous one of Bartram by twenty years. See also Miss Vail's account (Jour. N. Y. Bot. Gard. 2: 183. 1901) of "An Old Physic Garden in New Amsterdam," from a description published by Jonker Van der Donck in 1656.

by Dr. Hosack in New York, was apparently the first in America to come under public ownership, even though that ownership was of short duration.

After unsuccessful efforts to induce Columbia College and, later, the State of New York to appropriate money to establish and maintain a botanical garden, Dr. Hosack purchased of the city corporation in 1801 nearly twenty acres of land, "distant from the city about three miles and a half," lying west of "Middle Road" (now Fifth Avenue), between the present 47th and 51st Streets, and extending nearly to what is now Sixth Avenue. The purchase price was $4,807.36 and "a quit rent of sixteen bushels of good merchantable wheat to be paid every May 1 in kind, or its equivalent in gold or silver coin." Garden work was begun in 1801, but the deed, signed by Mayor DeWitt Clinton, was not executed until August 6, 1804, probably on completion of payment by the purchaser. Later, in 1810, in exchange for the City's rights in proposed streets intersecting the property, Dr. Hosack conveyed to the City a plot of about five acres on 57th Street. In 1806, in the preface of his first "Catalogue of Plants contained in the Botanic Garden at Elgin, in the vicinity of New York," Dr. Hosack states that the greater part of the tract is in cultivation and that "a conservatory for the more hardy greenhouse plants, has been built; in addition to which two Hot-Houses are now erecting for the preservation of those plants which require a greater degree of heat." A little later he tells us that "The whole establishment was enclosed by a stone wall, two and a half feet in breadth and seven and a half feet high." His complaint of "the high price of manual labour" sounds remarkably modern, but he does not let us know the scale of wages prevailing at that time. Dr. Hosack's list of species in his garden in 1806 includes about 1,700 names. Dr. Francis, in his "Old New York," says:

"In 1807 the garden was a triumph of individual zeal, ambition, and liberality, of which our citizens had reason to be proud. The eminent projector of this garden, with princely munificence, had made these grounds a resort for the admirers of Nature's vegetable wonders and for the students of her mysteries."

But the expense of maintaining and developing a botanical garden of twenty acres became too heavy, even though his medical practice is said to have been "large and lucrative" and at the end of 1807, to put the situation in Dr. Hosack's own words:

"Finding my expenses for these several purposes far exceed the calculations I had formed, and that they were far more than prudence would justify, especially with an increasing family of children, and being desirous of perpetuating the benefits of this institution, I at once resolved to offer the whole establishment for sale to the state, at a fair and equitable valuation."

Dr. Hosack's memorial on this subject, presented to the Assembly at Albany on April 5, 1808, failed to receive proper consideration on account of being introduced late in the session. He was, however, invited to renew his request the next year, which he did, with the support of the Faculty of Physic of Columbia College and the Medical Society of the City and County of New York. After a favorable report from the committee of the Assembly to which the memorial of 1809 was referred, a bill looking to the purchase of the property by the state was introduced and after several favorable votes on various phases and amendments was finally defeated by a vote of 49 to 43. Dr. Hosack's first impulse was now to dispose of the property by private sale, but encouraged by strong backing from the Medical Society of the County of New York and of other medical societies throughout the state, the governors of the New York Hospital, and the Mayor and Common Council of New York, he renewed his plea to the State Legislature of 1810, and this time he was successful and "An Act for Promoting Medical Science in New York" by the purchase of "the botanic garden, commonly called Elgin," at a valuation to be determined by the commissioners of the Land Office, passed both the Senate and Assembly by fairly comfortable margins. This act of the State Legislature authorized the raising of the purchase money by a lottery and provided

"*always,* That the said commissioners shall not be authorized to include in such valuation the trees, plants, and shrubs, appertaining to the said botanic garden, but they shall nevertheless require that the said trees, plants and shrubs shall be conveyed by said deed."

On June 5, 1810, the five appraisers appointed by the commissioners of the Land Office, after six weeks' work, reported that

"Taking into consideration the delay of payment resulting from the mode adopted by the legislature (which we consider as equivalent, upon an average, to a delay of five years and a half) do estimate and value the same garden, with the appurtenances,

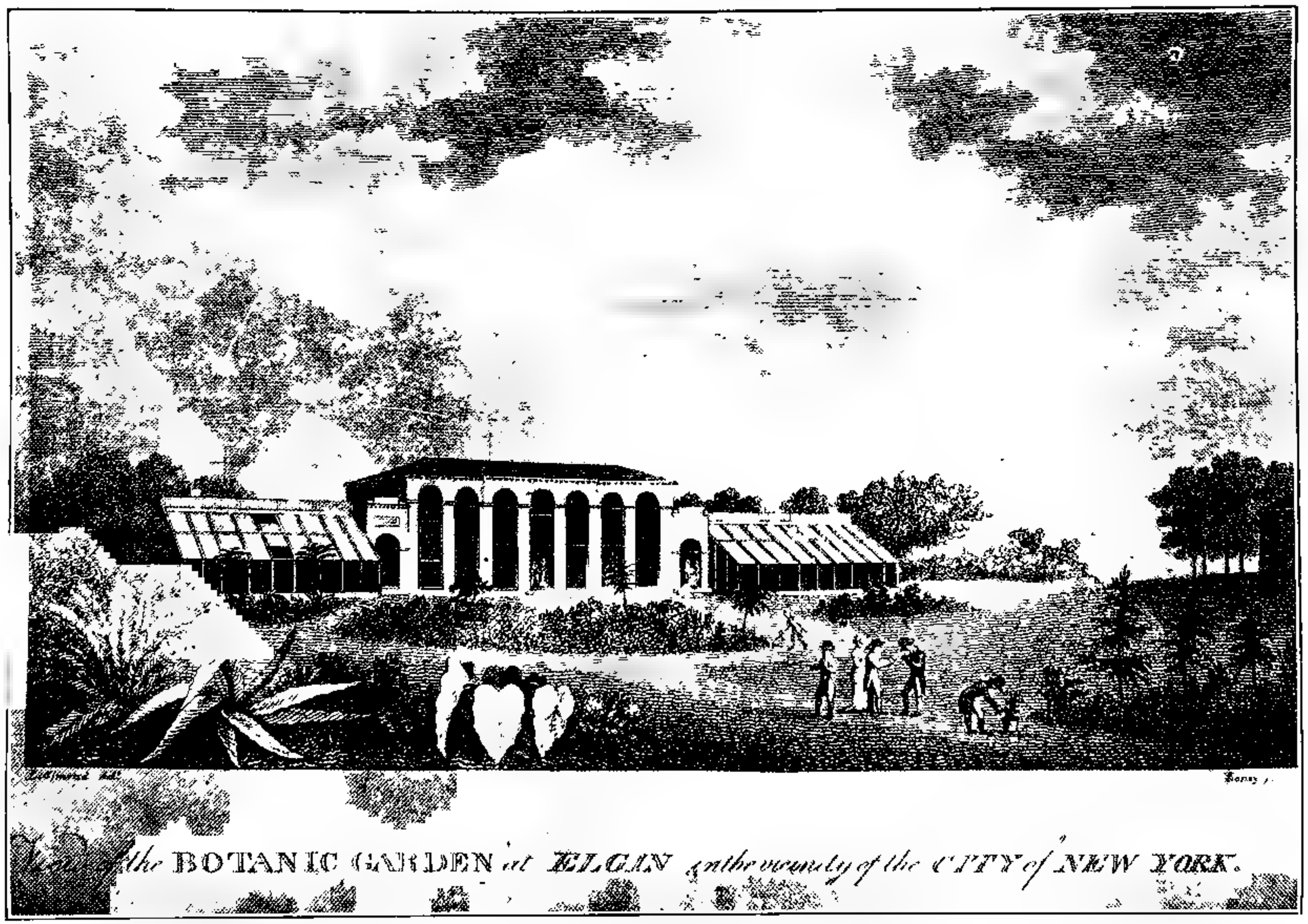

FIGURE 1. The Elgin Botanic Garden (from The Medical Repository, vol. 13, January, 1810). The site

exclusive of trees, shrubs, and plants in and upon the same, under the above circumstances, at one hundred and three thousand one hundred and thirty-seven dollars."

The Secretary of the Land Office then requested the appraisers to submit a valuation "exclusive of any allowance for delay of payment." Under this condition, their figures for the land ("nineteen acres, three roods and thirty-eight perches"), including the stone fence, were $49,968.75, and for the buildings $24,-300.00, making a total of $74,268.75. This appraisal Dr. Hosack accepted, although insisting that his disbursements, "with the addition of simple interest for five years," exceeded this sum by "upwards of twenty-eight thousand dollars." The deed of the property to the people of the State of New York bears the date of January 3, 1811. The plants, including garden tools, etc., were appraised by John Hastings, Nurseryman; Frederick Pursh, Botanist; and John Brown, Nurseryman, at "twelve thousand six hundred and thirty-five dollars and seventy-four and a half cents," although Andrew Gentle, Botanist and Seedsman, brought in a minority report, valuing them at "fourteen thousand three hundred and eighty dollars and fifty-nine cents." It seems, however, that Dr. Hosack never received any compensation for the plants, although a statement in Judge Addison Brown's account of the Elgin Botanic Garden might seem to imply that he did.

By the act of the State Legislature, authorizing the purchase of the Elgin Garden, the supervision of it was referred to the Regents of the University of the State of New York, but with the stipulation that

"It shall be attended with no future charge or expense to the state: *Provided always,* That the physicians and students of medicine throughout the state shall at all times have access to the said botanic garden free from any expense: *And provided further,* and it is the true intent and meaning of this act, that the people of this state shall have the right at all times to sell and dispose of said property in such way and for such purposes as they may deem expedient."

A wood cut (see FIGURE 2) published as a frontispiece of Dr. Hosack's "Hortus Elginensis: or a Catalogue of Plants, Indigenous and Exotic, cultivated in the Elgin Botanic Garden, in the vicinity of the City of New York," the preface of which is dated March 12, 1811, bears the legend "View of the Botanic Garden

View of the BOTANIC GARDEN *of the* STATE *of* NEW-YORK.

Published in 1801

of the State of New York, established in 1801." In May, 1811, the administration of the garden was referred by the Regents to the College of Physicians and Surgeons, which had been organized by the Regents in 1807. At about that time Dr. Hosack accepted professorships of medical subjects in the College of Physicians and Surgeons, then located at the corner of Broadway and Barclay Street, and soon known to some of the newspaper men of that day as "Hosack's College," even as the Elgin Botanic Garden and the Botanic Garden of the State of New York were sometimes referred to as "Hosack's Garden." Dr. Hosack's withdrawal from the professorship of Botany and Materia Medica in Columbia College in 1811 seems to have resulted in the disappearance of medical instruction in Columbia College until a merger in 1860 by which the College of Physicians and Surgeons became the Medical Department of Columbia College and later the College of Physicians and Surgeons of Columbia University.

It was the hope of Dr. Hosack that his garden under the new state ownership would become a well-supported public institution comparable to the Jardin des Plantes of Paris, but evidently the time was not ripe for any such consummation. The four-year-old College of Physicians and Surgeons, to whose care, without supporting appropriations, the Garden had been assigned by the State Regents, had only a slender income, the Garden was more than three miles away, the second war with England, with its Embargo Act and general financial depression, soon came on, and the "Botanic Garden of the State of New York" was very naturally considered a burden rather than an asset by the College of Physicians and Surgeons; and, in spite of the fatherly interest of Dr. Hosack, a rather curious act of the State Legislature in 1814, transferring title to the property to Columbia College, seemed to be welcomed by the Physicians and Surgeons. Columbia College was then located on Park Place, near West Broadway, on land granted to the College by Trinity Church and constituting a part of what the officials of Columbia University now refer to as the "Lower Estate," and it seems that the growth of the city had already suggested a removal to a less congested area. It appears that the Act of the State Legislature of 1814 was primarily intended to benefit Union College. It was entitled "An Act instituting a Lottery for the Promotion of Literature and other

useful Purposes." Of the proceeds of this lottery, $200,000 was to be paid to Union College, $40,000 to Hamilton College, $30,000 to the College of Physicians and Surgeons, and $4,000 to the Asbury Colored Church of New York. A sixth section was appended to the act, quoted as follows by Judge Brown:

"That all the right, title and interest of the People of the State in and to all that certain piece or parcel of land . . . situate in the 9th Ward of the City of New York known by the name of the Botanic Garden and lately conveyed to the People &c. by David Hosack, be and the same is hereby granted to and vested in the Trustees of Columbia College; but this grant is made upon the express *condition* that the college establishment shall be removed to the said tract of land hereby granted, or to lands adjacent thereto, within twelve years from this time."

Also, a seventh section, directing that

"The Trustees of the College, within 3 months shall transmit to the trustees of the other colleges of the State a list of the different kinds of plants, flowers and shrubs in the said garden, and within one year thereafter deliver at the said garden, if required, at least one healthy exotic flower, shrub or plant of each kind of which they shall have more than one at the time of application, together with the jar or vessel containing the same, to the trustees of each of the other colleges who shall apply therefor."

It is probable that the legislators considered the gift of this state-owned land to Columbia College as an equivalent of the $40,000 in cash that was to go to Hamilton College from the proceeds of the authorized lottery, but the action of the Reverend Doctor Mason, Columbia's provost, in accepting it as such an equivalent, did not meet with the unqualified approval of the friends of Columbia. A few years later, the conditions as to the removal of the College and the distribution of the duplicate plants were repealed. There is no evidence that any college ever asked for any of the duplicate plants, but in the records of the New York Hospital for the years 1819 and 1821, there is evidence that some of the plants went to its new site on Morningside Heights, now occupied by Columbia University. There is a plausible tradition,[3] without conclusive proofs, that two of these were the pair of large English yews that stood for some years in the South Court of the present imposing Library of the University.

[3] L. M. Underwood, Columbia Univ. Quarterly **5**: 279. 1903. John B. Pine, The Old Yew Trees. Columbia Univ. Quarterly **16**: 402. 1914.

In 1819, on the plea that the land was not of one-fourth the supposed value and "had not been productive of the benefit intended," the State Legislature voted Columbia a cash gift of $10,000. In 1823, the grounds were rented for five years for $125 a year and taxes, with the understanding that the tenant was "to keep the grounds and buildings in order, and not to lop, cut, or remove any trees or shrubbery, or to pasture other than his own cattle." It would appear, however, that this lease was short-lived, for in April, 1826, the Garden was let to David Barnett, seedsman, for ten years at an annual rental of $500, plus taxes. But, once more, twenty acres of Manhattan land, with four blocks of Fifth Avenue frontage, failed to excite any foreshadowing of the lively appreciation that was afterwards to be bestowed upon it. Mr. Barnett considered the rental exorbitant, and refused to pay it. The next year the College collected $118 by the attachment and sale of his visible goods and cancelled the lease. In 1838, the City began opening streets through the property, an operation that is said to have cost the College more than $150,000 during the next twenty-five years. This involved the shouldering of a debt and many of the trustees advocated selling the land at the prevailing prices, but better counsels prevailed. Only a few lots were sold. In 1857, Columbia College moved uptown, not to the site of the Elgin Garden, but a little to the eastward, to the grounds and buildings of the former Asylum occupying the block bounded by Madison and Park Avenues and 49th and 50th Streets, where it remained for forty years. The former Elgin Garden was considered of more value as a "nurse" for the College than as a site for it. Before 1875 the ground was covered with high-class buildings, mostly residences, under renewable 21-year leaseholds of the land, and Columbia began to enjoy "highly profitable rentals." Late in the '90's, Columbia University, as it had then become, sold the block between 47th and 48th Streets, and the proceeds covered a considerable part of the cost of the removal of the University to its present site on Morningside Heights in 1897. The recent lease of the residue of Columbia's "Upper Estate" to Mr. Rockefeller serves to confirm the justice of Judge Addison Brown's observation in 1908:

"If these splendid results have sprung primarily from Dr. Hosack's courageous and brilliant enterprise, they are equally the

fruit of the sagacious and heroic tenacity of the College trustees for three quarters of a century in holding on to the Garden property, and in resisting the temptation to purchase present ease and freedom from debt at the sacrifice of a triumphant future."

In 1899, the New York Academy of Medicine, evidently recognizing the then recently established New York Botanical Garden as the legitimate and permanent successor of the Elgin Botanic Garden, presented to the Garden 205 volumes of books, mostly from Dr. Hosack's library. These were listed in the JOURNAL for February, 1900, and are now among the Garden's most treasured possessions, as is also an attractive oil painting of New York's first botanic garden, that now hangs in the reading room of the Garden Library. This was presented in 1902 by Miss Rebecca Harvey, a granddaughter of its founder, Dr. David Hosack.

MARSHALL A. HOWE.

THE PREFACE OF DR. HOSACK'S "HORTUS ELGINENSIS" (SECOND EDITION, 1811)

The establishment of a Botanic Garden in the United States, as a repository of the native plants of this country, and as subservient to the purposes of medicine, agriculture, and the arts, is doubtless an object of great importance. Impressed with the advantages to be derived from an institution of this nature, I have anxiously endeavoured ever since my appointment to the professorship of Botany and Materia Medica in Columbia College, to accomplish its establishment. Disappointed, however, in my first applications to the Legislature of this State, soliciting their assistance in so expensive and arduous an undertaking, I resolved to devote my own private funds to the prosecution of this object; trusting, that when the nature of the institution should be better, and more generally known, and its utility fully ascertained, it would receive the patronage and support of the public.

Accordingly, in the year 1801, I purchased of the Corporation of the city of New York, twenty acres of ground, situated on the middle road between Bloomingdale and Kingsbridge, and distant from the city about three miles and an half. The view from the most elevated part, is variegated and extensive, and the soil itself of that diversified nature, as to be particularly well adapted to the cultivation of a great variety of vegetable productions. The greater part of the ground is at present in a state of promising cultivation, arranged in a manner the best adapted to the different kinds of vegetables, and planted agreeably to the most approved

style of ornamental gardening. Since that time, an extensive conservatory, for the more hardy green house plants, and two spacious hot houses, for the preservation of those which require a greater degree of heat, the whole, exhibiting a front of one hundred and eighty feet, have been erected and which, experience has shown, are well calculated for the purpose for which they were designed. The whole establishment is surrounded by a belt of forest trees and shrubs, both native and exotic, and these again are enclosed by a stone wall, two and an half feet in thickness, and seven feet in height.

As it has always been a primary object of attention to collect and cultivate in this establishment, the native plants of this country, especially such as are possessed of medicinal properties, or are otherwise useful, such gardeners as were practically acquainted with our indigenous productions, have been employed to procure them: how far this end has been attained, will be best seen by an examination of the Catalogue.

Although much has been done by the governments of Great-Britain, France, Spain, Sweden, and Germany, in the investigation of the vegetable productions of America: although much has been accomplished by the labours of *Catesby, Kalm, Wangenheim, Schoepf, Walter,* and the *Michaux;* and by our countrymen *Clayton,* the *Bartrams, Colden, Muhlenberg, Marshall, Cutler,* and the learned Professor *Barton* of Pennsylvania, much yet remains to be done in this western part of the globe. The numerous articles of medicine which this country has already furnished; the variety of soils and climates which it comprehends, encourage the belief, that many more remain to be discovered, and that the Materia Medica may still be enriched by the addition of many indigenous plants, whose virtues yet remain undiscovered.

Another object of importance is, to afford to students of medicine, the means of acquiring a knowledge of the natural history of plants, and the principles of botanic arrangement; a science intimately connected with their profession, as it not only enables them to distinguish one plant from another, but frequently leads to an acquaintance with their medicinal virtues. For this purpose the grounds are divided into different compartments, calculated to exhibit the various plants according to their several properties; and these again are so arranged as to afford a practical illustration of the systems of botany at present most esteemed, viz. the sexual system of *Linnaeus,* and the natural orders of *Jussieu.*

Hitherto the botanical gardens of *Edinburgh, Oxford, Cambridge, London, Paris, Copenhagen, Leyden, Upsal, Goettengen,* &c. have instructed the American youth in this department of medical education; and it is in some degree owing to those establishments that the universities and colleges of those places have

become so celebrated, and have been resorted to by students of medicine from all parts of the world.

Since the publication of the first edition of this catalogue, in 1806, this institution has been greatly improved, and by an act of the Legislature, passed on the 12th day of March, 1810, has been purchased by the State for the benefit of the Medical Schools of New York. For information upon this subject the reader is referred to a production entitled, " A Statement of Facts relative to the Establishment and Progress of the Elgin Botanic Garden, and the subsequent disposal of the same to the State of New York," just published; in which the liberal and enlightened views of the Legislature, in making so large and honourable an appropriation for the promotion of science are more fully exhibited than would be proper upon this occasion. It will also be perceived by a comparison of the present with the former edition, that very considerable additions have been made to the collection both of the foreign and indigenous plants contained in that establishment. Gratitude demands of me, on this occasion, an acknowledgment of the obligations I am under to many distinguished botanists, both abroad and at home, who have contributed to this institution. In this number are to be enumerated my much esteemed and respected friend and instructor, Dr. *James Edward Smith,* the learned President of the Linnaean Society of London; the late Professor *Vahl,* and Mr. *Hoffman Bang,* of Copenhagen; Mons. *Desfontaines* and *Thouin,* the celebrated Professors of Botany and Agriculture at the Medical Schools of Paris; Mr. *Salisbury,* Proprietor of the Botanic Garden at Brompton, near London; the late Dr. *Fabroni,* Director of the Royal Museum of Florence; Dr. *Bostock,* the learned President of the Botanic Institution of Liverpool; Dr. *Lettsom,* of London; Dr. *Andrew Michaux,* Editor of the Flora Boreali Americana, and Author of the very valuable History of the Forest Trees of North America, now publishing at Paris; my much esteemed friend Dr. *Alire Raffineau Delile,* of the Institute of Egypt; Dr. *Alexander Anderson,* Superintendent of the Botanic Garden at St. Vincents; and *Baron De Schack,* of Martinique. From these gentlemen I have received many rare botanical works, and some of the most valuable plants in this collection.

Nor must I be unmindful of the obligations I am under to several gentlemen in this country, distinguished for their taste and talents in this department of science. The Hon. *Robert R. Livingston,* our former Minister in France; Professor *Mitchill,* of this city; *John Stevens,* Esq., of Hoboken; Mr. *Bernard M'Mahon,* of Philadelphia; Mr. *Stephen Elliot,* of Beaufort, South-Carolina; Dr. *Darlington,* and Mr. *John Vaughan,* of Pennsylvania; *John Le Conte,* Esq., of Georgia; Mr. *William*

Prince, of Long-Island; and Mr. *Andrew Gentle,* seedsman, of this city; are also among the contributors to this institution. It is but justice to the merit of my nephew, Dr. *Caspar Wistar Eddy,* a young but accurate botanist, to add, that he has largely augmented the collection of American plants, especially of those of the island of New York; some of which, viz. two new species of *Gerardia,* were first discovered by him in the vicinity of this city. From my other pupils now industriously prosecuting the study of botany and medicine, more especially Mr. *John W. Francis,* and Mr. *Isaac Roosevelt,* of this city, and Mr. *Robert M. Barclay,* of Orange county, I also anticipate many fruits of their labours in this department of science.

It would be injustice to my late gardener, Mr. *Frederick Pursh,* who with a knowledge of the science of botany unites a very extensive and accurate acquaintance with the plants of this country, not to notice the very numerous contributions he has made to the collection, of the native plants of the United States, during the period he had charge of this establishment. The institution is also at present, and has been for some months past, in a very flourishing condition, under the direction of Mr. *Dennison,* who has been very particularly recommended to me by Messrs. *Lee* and *Kennedy,* of Hammersmith. The present state of the collection is an evidence of his attention and skill, and from which I expect great improvements in every part of the establishment.

I avail myself of this occasion to observe, that as soon as measures may be taken by the Regents of the University for the permanent preservation of the Botanic Garden, it is my intention immediately to commence the publication of American Botany, or a *Flora of the United States.* In this work it is my design to give a description of the plant, noticing its essential characters, synonyms, and place of growth, with observations on the uses to which it is applied in medicine, agriculture, or the arts; to be illustrated by a coloured engraving, in the same manner in which the plants of Great-Britain have been published by Dr. *J. E. Smith,* in his English Botany. Considerable progress has already been made in obtaining materials for this publication: many of the drawings will be executed by Mr. *James Inderwick,* a young gentleman of great genius and taste, and others by *John Le Conte,* Esq., whose acquaintance with botany and natural history in general will enable him to execute this part of the work with great fidelity. In Mr. *Pursh,* whose name has already been mentioned, I shall have a very industrious and skillful botanist to collect from different parts of the union such plants as have not yet been assembled at the Botanic Garden.

D. H.

NEW YORK, MARCH 12TH, 1811.

PENINSULA DELMARVA

It has long been known that the protective armament of many prickly-pears is more or less efficacious against the depredations of quadrupeds. It has, moreover, also proved forbidding and repellent to man. Botanists, as a rule, have shied, so to speak, at the sight of a prickly-pear plant. That is to say, collectors rarely ventured to gather or to make specimens of them. The result has been that only quite recently, after a lapse of several centuries of botanical activity, in a country comprising the coastwise states from Florida to Massachusetts, with a population of over thirty millions, have the species of *Opuntia,* and their geographic distributions, come to be at all well known. This condition may be illustrated by the fact that in a short period of botanical exploration about the beginning of the present decade, more than thirty kinds of native and naturalized cacti were added to the known flora of the Atlantic Coastal Plain. Curiously enough, the localities and habitats of these plants were, for the most part, not new to botanical collectors!

Progressive developments in our knowledge of the prickly-pears of the Atlantic Coastal Plain,[1] culminating first in reports of the occurrence of *Opuntia* in the State of Delaware—a region not definitely credited with a native prickly-pear—and later in the actual collection of specimens, incited the writer to make a short reconnaissance in Delaware, contiguous Maryland, and peninsular Virginia, or in other words, in Delmarva.[2] The last week of July, 1920, was devoted to this survey and the Delmarvan peninsula was traversed from the northern end of Delaware to Cape Charles. The party consisted of Edgar T. Wherry, George K. Small, John W. Small, and the writer. A collection of the rarer and more interesting plants encountered was made for the herbarium of The New York Botanical Garden.

The floras and floristics of peninsulas seem always to be particularly interesting. There are four large peninsulas on the Atlantic coast of North America, all with a southerly trend—

[1] Journal of The New York Botanical Garden **26**: 241–258, 265–285. 1925.

[2] A popular designation made up of abbreviations of the names of the three States involved. The term "Eastern shore" (*i.e.,* of Chesapeake Bay) is also widely known and used.

Nova Scotia, southern New Jersey, Delmarva, and peninsular Florida. The first mentioned is far removed to the north, but still has a tinge of southern vegetation. The second and third are neighbors, and floristically have much in common in that they form a meeting ground for southern and northern plants. The fourth peninsula lies far to the south, but it has a coloring of northern vegetation. Incidentally it is interesting to notice how near Newfoundland came to being a peninsula, instead of an island.

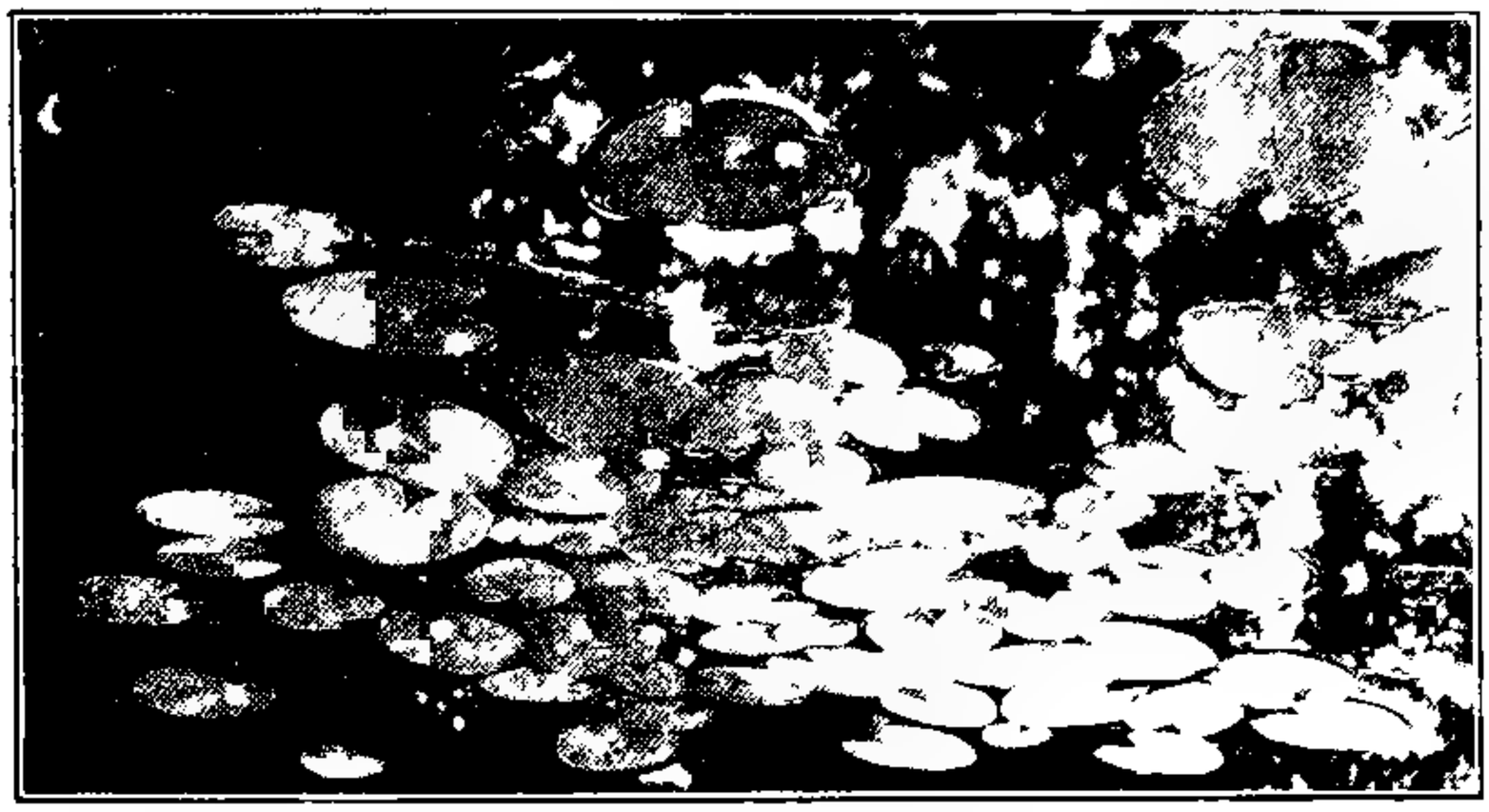

FIGURE 3. This is not a pond-lily, but a relative of the gentians, floating-heart (*Nymphoides aquaticum*). The peninsula's maze of waterways supports a large assortment of aquatic plants.

The area most directly under consideration comprises the State of Delaware, about one third of Maryland, and a small fraction of Virginia—nearly 6,000 square miles in all. It is essentially all Coastal Plain. The peninsula is nearly two hundred miles long and has a maximum width of about seventy miles. It is almost an island, for the neck, at the north, is scarcely ten miles wide. In fact, it is almost a series of islands, for the headwaters of some of the rivers and creeks that flow east or west nearly meet at their sources, or to some extent overlap. The area, except for the northern boundary of Delaware, lies between the Delaware River, Delaware Bay, and the Atlantic Ocean on the east and Chesapeake Bay on the west. The ocean front has barrier-dunes and lagoons just as we find in New Jersey and in Florida.

The Chesapeake Bay side is an exceedingly serrated or eroded shore line with numerous outlying islands.

With a long growing season and a climate tempered by its geographic position, this region, like the New Jersey pine barrens, harbors some plants quite different from those of the same latitude of the neighboring inland territory.

We traversed the backbone of the peninsula from the northern end to Cape Charles and made lateral excursions to the ocean

FIGURE 4. The hay-scented fern (*Dennstaedtia punctilobula*) is usually associated with highland habitats. However, in the woodlands of the peninsula it often grows with luxuriance equal to that attained in the mountains.

front at Lewes, Rehoboth, and Ocean City, as well as at Cape Charles. Our first concern was the discovery of cacti.[6] Prickly-pears are now known to grow naturally in the peninsula at Ellendale, Millsboro, Rehoboth, Ocean City, Sharptown region, both

[3] The occurrence of prickly-pears in Wicomico County, Maryland, was reported by the Rev. J. P. Otis, of Marshallton, Delaware, several years ago. In the preceding spring Mr. Otis had collected specimens at Millsboro and Rehoboth of the form referred to on a following page as "a second form of prickly-pear." With Mr. Otis' notes and Dr. Wherry's personal knowledge of the region we promptly located many stations for *Opuntia*.

in Maryland and in Delaware, and throughout the Cape Charles region.

The wide-spread species is *Opuntia Pollardi,* originally described from southern Mississippi several years ago. Later we found it in Florida, and then gradually followed its distribution up the Atlantic Coastal Plain, successively, through Georgia, South Carolina, and into North Carolina in the winter of 1919. After this the reports of prickly-pears in Delaware began to come

FIGURE 5. Drum-heads (*Polygala cruciata*) growing in a swamp. This is one of the three-dozen kinds of "candy roots" that grow in the Coastal Plain. All, except one, of these species of *Polygala* contain gaultherin and readily give off the fragrance of wintergreen, whence the name candy-root.

in, and they indicated, as far as they went, more northern stations for this decidedly southern plant.

Apparently the genus *Opuntia* is neither rare nor local in this tri-state peninsula. It evidently is, or rather was, up to recent times, scattered all over the area. Extensive agricultural operations have resulted in the clearing of the land of the larger part of the peninsula. However, it appears that many farms have maintained a reserve of considerable timbered areas. In the cultivated fields the prickly-pear plants have been both naturally and intentionally destroyed; but in the forested portion cactus plants may be expected almost anywhere. In the dense pinewoods the

plants are often sparse. However, in the low, open, broad-leaved woods, or half-prairie-like spots the growth of prickly-pears is copious and often dense. It is, indeed, just as luxuriant in this northern latitude as it is in Florida or other more southern regions.

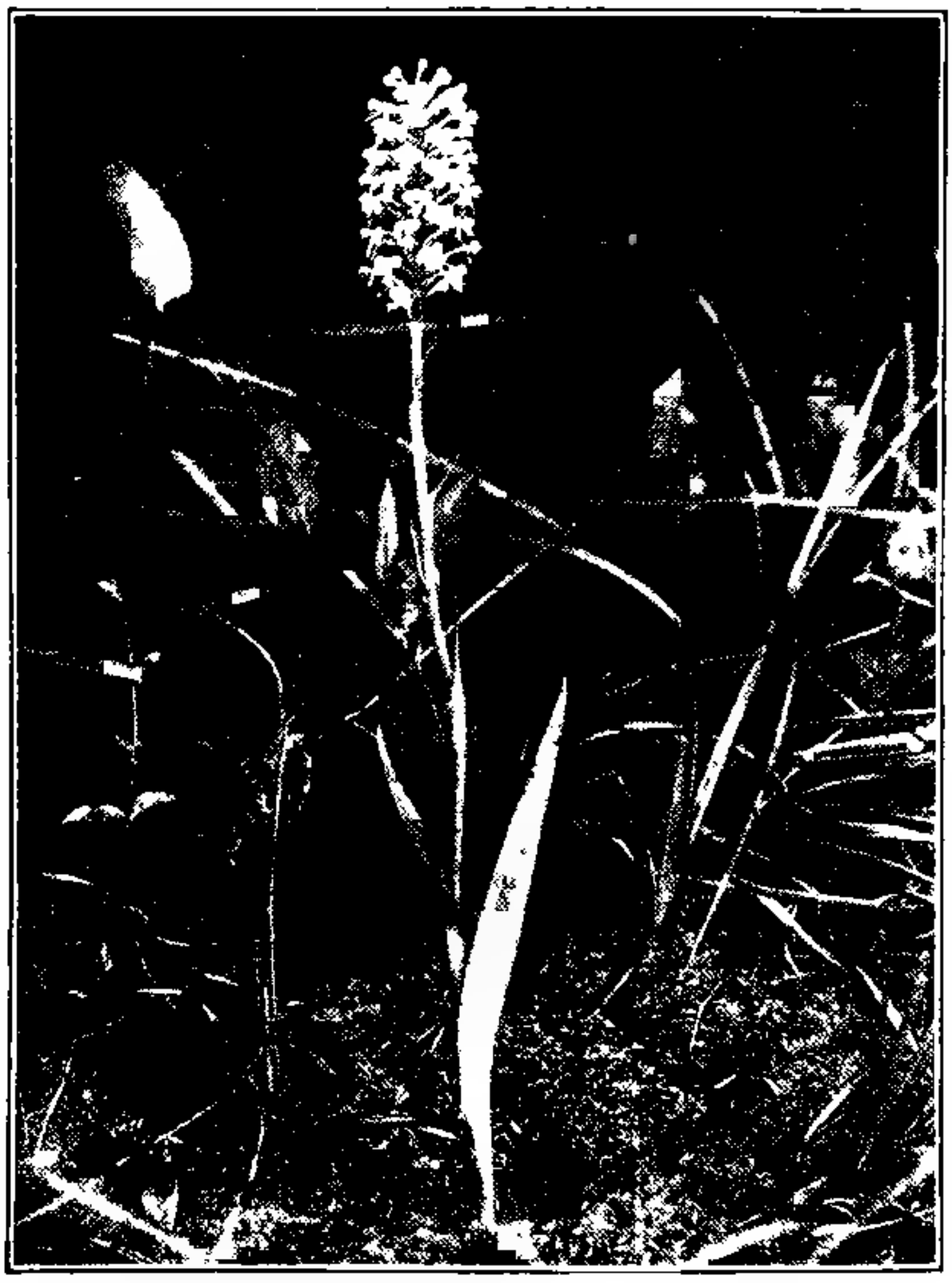

FIGURE 6. Bog plants abound in the peninsula. Orchids are often abundant. This crested orchid (*Blephariglottis cristata*) grows in sphagnum bogs. It was discovered in the Carolinas about the beginning of the past century. It ranges throughout the length of the Coastal Plain.

Although the peninsula is rather wide in some places, none of it is quite free from coastal influences, for the altitude is slight and the tidal streams and marshes extend far inland. But, to consider the immediate coastal parts: There we found two habitats for the cactus. It grew sparingly on the active dunes, where,

however, its existence is precarious, for the shifting sands either leave the plants stranded without anchorage or bury the colonies so that the plants are smothered partially or completely. However, there is a place where it thrives as luxuriantly as it does in the open woods in the interior, namely, along and near the line marking the boundary between the active and the stationary dunes. This boundary is often indicated by a growth of cedar-trees (*Sabina virginiana*). The ground usually falls off abruptly just in front of the first row of trees. On this front slope the prickly-pear grows luxuriantly, often in large confluent or separated colonies. It is also plentiful on the plain among the cedars. Everywhere we found *Opuntia Pollardi,* the plants were true to the specific characters as shown in the more southern portion of its range—from the tuber-bearing subterranean parts to the fruits. The year of our visit all the colonies were found to bear fruits, and one even exhibited a belated flower.

A second kind of prickly-pear occurs both at Rehoboth and at Millsboro. As compared with true *Opuntia Pollardi,* which has thick obovate light-green joints and stout obovoid fruits, this additional plant has thin narrowly elliptic dark-green joints and slender clavate-obvoid fruits. Whether it is an extreme shade phase of *Opuntia Pollardi* or another species is a problem that remains to be solved.

The twin peninsulas, southern New Jersey and Delmarva, are separated from each other by the Delaware River and by Delaware Bay. The distance is not great, yet there are marked differences in the floras of the two regions. However, there are similarities also. Naturally, Delmarva partakes of the floras of the territory on either side of it—north and south.[4]

The highly specialized pine-barrens of southern New Jersey are replaced in Delmarva by a kind of pseudo-pinebarren. A different or differently placed substratum has, apparently, prevented so complete a leaching of the soil as in the case of the New Jersey barrens. Therefore, we find less "severe" vegetation, so to speak. Instead of the strongly dominant pines, the

[4] Two articles on this peninsula have been published by Dr. R. M. Harper—Car-window notes on the vegetation of the Delaware peninsula and southern Virginia. Torreya 9: 217–226. 1909. A forest reconnaissance of the Delaware peninsula. Jour. Forestry 17: 546–555. 1919.

broad-leaved shrubs and trees are more copious and better developed.

There is a fundamental difference, too, in the pine covering the two peninsulas. In the pine-barrens of New Jersey, the dominant conifer is the pitch pine (*Pinus rigida*). In Delmarva the dominant one is the old-field pine (*Pinus Taeda*).

This is a rather striking difference for two areas separated only by the Delaware's waters. The old-field pine occurs in New Jersey too, but it is rare, while the pitch-pine likewise may be found in Delmarva. The genus Pinus is further represented in both areas, for besides the two species mentioned above there are present: scrub-pine (*Pinus virginiana*), short-leaf pine (*P. echinata*), and black pine (*P. serotina*).

From the standpoint of geographic distribution the region under consideration is noteworthy. It is the frontier or near the frontier, so to speak, for some typically southern species of flowering plants. One important timber tree, the cypress (*Taxodium distichum*), reaches its present natural northern limit in Delaware and neighboring Cape May, New Jersey. Likewise, among the typically southern species not found further north may be mentioned:

Spoon-leaf beargrass—*Yucca concava.*
Canby's bulrush—*Scirpus etuberculatus.*
Long-moss –*Dendropogon usneoides.*
Low-candyroot—*Polygala ramosa.*
Tall-candyroot—*Polygala cymosa.*
Pollard's prickly-pear—*Opuntia Pollardi.*
Cowbane –*Oxypolis filiformis.*
Indian pennywort—*Centella repanda.*
Seaside heliotrope –*Heliotropium curassavicum.*
Crossvine *Anisostichus capreolata.*
Elephant-foot –*Elephantopus nudatus.*

A larger number of typically southern, largely pine-barren, plants which come to their northern limit in New Jersey are even more conspicuous in Delmarva. They are:

Tall yellow-eyed grass—*Xyris elata.*
Fringed yellow-eyed grass—*Xyris fimbriata.*
False-asphodel—*Triantha racemosa.*

Turkey-beard—*Xerophyllum asphodeloides.*
Swamp-pink—*Helonias bullata.*
Pinebarren-camas—*Oceanoros leimanthoides.*
Bamboo-vine—*Smilax laurifolia.*
Red-berry bamboo—*Smilax Walteri.*
Bog star-grass *Lophiola aurea.*
Bay spikes—*Gymnadeniopsis integra.*
Bog-torches—*Gymnadeniopsis nivea.*
Bay berry or Myrtle—*Cerothamnus ceriferus.*
Virginia-willow—*Itea virginica.*
Maryland-candyroot—*Polygala mariana.*
Pinebarren-St. John's wort—*Hypericum ovalifolium.*
Pinebarren meadow-beauty—*Rhexia aristosa.*
Beach evening-primrose—*Raimannia humifusa.*
Swamp-stars—*Sabbatia lanceolata.*
Wild-petunia—*Ruellia ciliosa.*
Canby's lobelia —*Lobelia Canbyi.*
Ashwort—*Senecio tomentosa.*

Well-known plants reach the southern limit of their distribution in the Coastal Plain, or on the line between the Piedmont and the Coastal Plain, for example: Shining-clubmoss (*Lycopodium lucidulum*), Creeping-wintergreen (*Gaultheria procumbens*), and the hemlock (*Tsuga canadensis*).

One remarkable liliaceous species, the bog-asphodel (*Abama americana*) occurs only in New Jersey, Delaware, and North Carolina. It is known to grow in about a dozen localities in the Jersey pinebarrens; but it has been collected at only one station in each of the other two, the North Carolina locality being a very recent discovery by Dr. Wherry.

Although the time of our visit was between the more prolific spring and fall seasons, many plants were in bloom. Three kinds of meadow-beauties (*Rhexia aristosa, R. mariana,* and *R. virginica*) decorated the boggy places. Not fewer than six kinds of milkworts or candy-roots (*Polygala cymosa, P. lutea, P. cruciata, P. mariana, P. Nuttallii,* and *P. incarnata*) were present, either in the bogs or in the high woods.

Rather open swamps were sometimes showy flower gardens. Within a small area one could gather the turk's-cap lily (*Lilium superbum*), false-asphodel (*Triantha racemosa*), four kinds of

orchids (*Blephariglottis Blephariglottis, B. lacera, B. cristata,* and *Gymnadeniopsis clavellata*), the meadow-beauties mentioned above, and some of the milkworts, St. John's-worts (*Hypericum canadense* and *H. ovalifolium*) sundews (*Drosera rotundifolia* and *D. intermedia*), lobelias (*Lobelia Nuttallii* and *L. Canbyi*).

The high pinelands were often yellow with the sweet-goldenrod (*Solidago odora*) and other kind of goldenrods were coming into flower. Various nascent asters were visible. Yellow foxgloves (*Aureolaria flava*), angelica (*Angelica villosa*), beggar-ticks (*Meibomia nudiflora*) and white topped aster (*Sericocarpus asteroides*) were in evidence.

Ponds had both submerged and floating plants. The latter—water-lilies (*Castalia*), spatterdocks (*Nymphaea*) and floating-heart (*Nymphoides*)—often well covered the surface of the water. The edges of ponds and marshes were commonly surrounded with a zone of pickerel-weed (*Pontederia*) and arrow-head (*Sagittaria*).

Both natural and artificial ditches were not without their flora. Various inconspicuous and showy uliginous plants were there. Wherever these did not grow with a rankness sufficient to crowd out other vegetation, one usually found true aquatics. The more abundant were two species of bladderworts—*Vesiculina purpurea* and *Utricularia radiata.*

The most ubiquitous shrubs were representatives of the huckleberry family—three kinds of blueberries (*Vaccinum corymbosum, V. atrococcum,* and *V vacillans*), three kinds of huckleberries (*Gaylussacia dumosa, G. frondosa,* and *G. baccata*) and the deerberry (*Polycodium stamineum*). These grow plentifully in both low and high situations. This list may be augmented by two additional shrubs of the same family. The cranberry (*Oxycoccus macrocarpus*) grows in the bogs and in low places on the coastal dunes, while a single plant of the box-huckleberry (*Gaylussacia brachycera*) is known in the peninsula.

The two outstanding woody plants of the peninsula are the box-huckleberry and the seaside-alder (*Alnus maritima*). These noteworthy plants, apparently, represent vanishing types of vegetation. The species were no doubt more widely distributed and copiously represented in former times. Today relatively few plants of the box-huckleberry are known to exist. The distribu-

tion may be summed up thus, one in Delaware, one in Maryland, two in the mountains of Pennsylvania, several in the mountains of Virginia–West Virginia, and two in the mountains near the boundary between Tennessee and Kentucky. In other words, there are but two individual plants represented in the Coastal Plain, of a species more characteristic of the mountains. The intervening Piedmont is apparently skipped entirely by this relic of a past geologic age.

The seaside-alder occurs along the rivers and the marshes in the middle part of the peninsula and it has been collected once, long ago, in Oklahoma. Both of these indicate mere fragments of former wider geographic distributions.

The forests, or such remnants as are there, seem healthy as a rule. However, the wide-spread chestnut blight had already (1920) extended its ravages as far south as Cape Charles.

Floristic phenomena are abundant in Delmarva. However, in that land of intermediate position between the North and the South, the plentiful thickets of the evergreen calico-bush (*Kalmia latifolia*), on the one hand, reminded one of the mountains, while, on the other, the cypress-swamps occupied by the deciduous-leaved *Taxodium distichum,* were much more reminiscent of Florida.

JOHN K. SMALL.

CONFERENCE NOTES FOR JANUARY

The regular monthly conference of the Scientific Staff and Registered Students of the Garden was held on the afternoon of January 9. Two subjects were presented, of which the following abstracts have been prepared by Dr. Barnhart and Dr. Hollick:

"The Ascidia of the Bladderworts," by Dr. J. H. Barnhart.

Much interest has been aroused recently in the mechanism by which the bladders of certain aquatic species of *Utricularia* capture their prey, by reason especially of an illustrated paper by Dr. A. F. Skutch, of The Johns Hopkins University, in the December number of *The Scientific American,* and a moving picture shown by Prof. F. E. Lloyd, of McGill University, at the recent meeting of the Botanical Society of America. It should be remembered, however, that most of the species of bladderworts are

terrestrial, and many are epiphytic, and the variety of structure of their ascidia makes it unlikely that their traps can operate in the same way as those adapted to an aquatic environment. The observations so far recorded merely deal with the fringe of a wide and inviting field for further study.

"New Species of Fossil Plants from Colorado," by Dr. Arthur Hollick:

Dr. Arthur Hollick showed and discussed three new species of fossil plants found in a collection from the Tertiary oil shales of De Beque, Colorado. The species include a spathe or sheath of a monocotyledonous plant, a well-defined leaflet of *Odostemon,* closely similar to *O. nutkanus* (DC.) Gaines, and a finely preserved pod of *Staphylea* that can hardly be differentiated from the living *S. trifolia* L. Photographs of the specimens, taken by Mr. H. C. Hartmann, were also shown and commented upon, especially in regard to their perfection of detail, and their superiority over drawings as subjects for reproduction and illustration. Illustrated descriptions of the species will be published in the near future.

A. B. STOUT,
Secretary of the Conference.

PUBLIC LECTURES DURING MARCH AND APRIL

The following is the program of illustrated lectures at The New York Botanical Garden during March and April. These lectures are given in the Museum Building on Saturday afternoons, beginning at 4:00 o'clock. Doors are opened at 4:15 to admit late-comers.

March 2. "My Journey through Lapland," Dr. Clyde Fisher.
March 9. "Wild Life and Scenery of the Catskills," Mr. S. Harmsted Chubb.
March 16. "Cottage Gardens," Miss Hilda Loines.
March 23. "Annuals," Mr. Arthur Herrington.
March 30. "New Ideas in Plant Nutrition," Dr. H. J. Wheeler.
April 6. "Gladiolus Culture," Dr. Forman T. McLean.
April 13. "Botany in Relation to Geology," Dr. Arthur Hollick.

April 20. "Twenty-five of America's Most Important Crop Plants," Dr. H. A. Gleason.
April 27. "Wild Flowers for the Rock Garden," Mr. Herbert Durand.

NOTES, NEWS, AND COMMENT

At the annual meeting of the Advisory Council of The New York Botanical Garden, held on January 8, 1929,

> "Mrs. Perkins moved that the Advisory Council record its deep sense of loss in the death of three members of the Council—Mrs. Frederick Constable, Mrs. A. A. Low, and Mrs Pierre Mali—and asked that the Secretary forward this motion to the editor of the JOURNAL OF THE NEW YORK BOTANICAL GARDEN.
> "Seconded and carried."

Dr. Donald A. Johansen, National Research Fellow in the Biological Sciences, who has been carrying on his studies at The New York Botanical Garden since early October, is returning to the Leland Stanford Junior University in California, where his previous work had been done. He has devoted himself chiefly to cytological researches in the Evening Primrose Family and he came to the Garden particularly to avail himself of the opportunity of consulting its library.

One of the popular house plants now being offered by the florists is the Billbergia. This interesting air plant thrives in our dry steam-heated rooms, is tolerant of neglect, and besides this, its rosette of thick fleshy leaves is so arranged that it forms a water-filled cup and serves as an admirable flower vase. Not only does it serve as a good container for flowers, but at this season of the year it likewise supplies the bouquet. There are several of these interesting plants in blossom at the present time in Conservatory Range 2 at The New York Botanical Garden. Sixteen different species of Billbergias are being grown in the house with the pineapples, the pitcher plants, and the Spanish moss. The flower-clusters are made up of bright red bracts and small greenish yellow flowers. The Saunders Billbergia has mottled leaves and bluish tips to its green blossoms. The Bruant

Billbergia is a hybrid variety with brilliant dark-red bracts, and *Billbergia zebrina* has mottled foliage, as its name implies. All of these plants flower in the winter or early spring and positively enjoy the dry conditions of our living rooms in winter. The Billbergias are tropical epiphytes, relatives of the pineapple and the Spanish moss. They naturally grow high up on the limbs of trees in the Brazilian tropical forests. There they have to depend on the natural rainfall for their water supply and so have providently developed the water cups in their hearts to store water and thick leathery leaves which are resistant to water loss. The Billbergia flower-stalk terminates the growth of the shoot and when it fades the old stalk dies and is replaced by side shoots from the root. Like all the air plants, the Billbergias like a very loose porous material around the roots. Moss, coconut fiber, or other loose material is very much better than soil for them, and during the winter they need so little water that an occasional sprinkle or filling of their water cup is ample. Their chief requirements are a warm place and good drainage around their roots. They also like plenty of sunlight; in fact it is this demand for light which first drove them up into the tops of trees in their native homes in the tropical forests. The epiphytes or air-plants assumed their strange habits principally in response to a demand for light. The tropical forests are so dense that only the plants growing in the tree tops can get enough light. Billbergias are now obtainable from most florists and make attractive and interesting house plants.—*Forman T. McLean.*

Meteorology for January. The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: 59° on the 6th; 51° on the 10th; *63½° on the 19th;* and 50° on the 23rd. The minimum temperatures recorded were: 18° on the 5th; *6½° on the 14th;* 15° on the 15th; 17½° on the 26th; and 15° on the 31st. The total precipitation for the month was 2.924 inches, .104 inch of which was from snow.

ACCESSIONS

Museums and Herbarium

1 specimen of *Carex* from Bermuda. (Given by Mrs. Sinclair Kennedy.)

15 specimens of *Pyxidanthera brevifolia* from North Carolina. (Given by Professor B. W. Wells.)

175 specimens of flowering plants from Costa Rica. (By exchange with the United States National Museum.)

12 specimens "North American Musci Pleurocarpi." (By exchange with Dr. A. J. Grout.)

16 specimens of mosses from Washington. (By exchange with Mr. C. M. Roberts.)

45 specimens of New Mexican mosses. (By exchange with Mr. E. B. Bartram.)

38 specimens of Mexican mosses. (By exchange with Brother Arsène.)

60 specimens of Chilian mosses. (By exchange with Brother Claude-Joseph.)

22 specimens of miscellaneous mosses from Florida. (By exchange with Dr. A. J. Grout.)

10 specimens of Venezuelan mosses. (Collected by Dr. Henri Pittier.)

12 specimens of Panama and Costa Rican mosses. (By exchange with the United States National Museum.)

14 specimens of miscellaneous South American mosses. (By exchange with the United States National Museum.)

8 specimens of mosses from Peru. (By exchange with the United States National Museum.)

14 specimens of Alaskan mosses. (By exchange with Dr. T. C. Frye.)

7 specimens of Canadian mosses. (By exchange with the Rev. H. Dupret.)

43 specimens of Utah mosses. (By exchange with Miss A. P. Evans.)

20 specimens of Brazilian mosses. (By exchange with Miss Eleanora Armitage.)

12 specimens of Alaskan mosses. (By exchange with Miss Patsy H. Lupo.)

8 specimens of South American mosses. (Collected by Dr. H. H. Rusby.)

4 specimens of Bolivian mosses. (By exchange with Brother Julio.)

41 specimens of Canadian mosses. (By exchange with Mr. C. W. Lowe.)

77 specimens of Greenland mosses. (Collected by Dr. E. O. Hovey.)

107 specimens of mosses from Rio Janeiro, Brazil. (By exchange with Dr. M. Bandeira.)

75 specimens "North American Musci Perfecti." (By exchange with Dr. A. J. Grout.)

25 specimens "Musci Acrocarpi Boreali-Americani et Europaei." (Distributed by Professor J. M. Holzinger.)

154 specimens of Jamaica mosses. (Given by Dr. W. R. Maxon.)

313 specimens of Costa Rica mosses. (Collected by Mr. Paul C. Standley.)

97 specimens of Costa Rican mosses. (By exchange with Mr. E. B. Bartram.)

14 specimens of Venezuelan mosses. (Collected by Mr. Henri Pittier.)

10 specimens of mosses from Peru. (By exchange with Dr. F. L. Herrera.)

6 specimens of Venezuelan mosses. (Given by Mr. G. H. Tate.)

40 specimens of mosses from California, Wyoming, and Utah. (By exchange with Mr. A. P. Kelley.)

37 specimens of mosses from Chile. (By exchange with Brother Claude-Joseph.)

176 specimens of Peruvian mosses. (By exchange with Mr. George S. Bryan.)

210 specimens of Mexican mosses. (By exchange with Brother Arsène.)

6 specimens of Bolivian mosses. (By exchange with Brother Julio.)

136 specimens of Colombian mosses. (Collected by Mr. E. P. Killip and Brother Artiste Joseph.)

44 specimens of mosses from the Galapagos Islands. (Collected by Professor Alban Stewart.)

20 specimens of Brazilian mosses. (By exchange with Dr. A. J. Grout.)

6 specimens of mosses from Kentucky. (By exchange with Dr. Jacques Maheu.)

40 specimens of Chilean mosses. (By exchange with Dr. H. Reimers.)

24 specimens of Venezuelan mosses. (Collected by Dr. J. N. Rose.)

6 specimens of Southern Californian mosses. (Collected by Professor C. F. Baker.)

4 specimens of Mexican mosses. (By exchange with Brother Arsène.)

4 specimens of mosses from Florida. (Collected by Dr. J. K. Small.)

8 specimens of Peruvian mosses. (By exchange with Dr. F. L. Herrera.)

4 specimens of miscellaneous mosses. (Given by Miss C. C. Haynes.)

5 specimens of mosses from Washington. (By exchange with Dr. J. W. Bailey.)

1 specimen of *Otidea leporina* from New York. (By exchange with Mr. Walter H. Snell.)

27 specimens "Fungi Dakotenses." (Distributed by Dr. J. F. Brenckle.)

25 specimens of *Pseudomonas Citri* from Alabama. (By exchange with the United States Department of Agriculture.)

841 specimens of fungi from Central and South America. (Distributed by Dr. F. L. Stevens.)

5 specimens of discomycetous fungi from Sweden. (By exchange with Dr. J. A. Nannfeldt.)

200 specimens "Fungi Exotici Exsiccati," fascicles 12–15. (Distributed by Hans Sydow.)

1 specimen of *Hypocrella viridans* from Trinidad. (By exchange with Dr. Roland Thaxter.)

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Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of narcissi, daffodils, tulips, irises, peonies, roses, lilies, water-lilies, gladioli, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than one million specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 38,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural, and forestal subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———

All requests for further information should be sent to

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GREENHOUSE SUGGESTIONS FOR THE AMATEUR[1]

The amateur's greenhouse can be used for one or more purposes:—

(1) Growing tender exotics as Cyclamen, Primulas, Chrysanthemums, etc.
(2) Forcing hardy plants to bloom out of season, as Spireas, Bleeding Hearts, Hyacinths, Lily of the Valley, etc.
(3) Raising half-hardy annuals and perennials for the summer display in the outside garden.
(4) Raising young vegetable plants to get out in the open ground and thus secure earlier crops.
(5) As a "plant hospital" for failing house-plants, or,
(6) To house a collection of a particular class of plants, as Orchids, Cacti, or Begonias.

The possession of a greenhouse enables the garden-lover to pursue his hobby throughout the year, while even those who are precluded by circumstances from enjoying the advantages of a garden can ofttimes know the pleasures of owning a greenhouse; nor are these pleasures reserved for those provided with large bank-balances, for our foremost greenhouse-building firms will erect and equip a house suited to the amateur's requirements for considerably less than the price of a good automobile, while a structure fitted up by a local carpenter or handy man will be even less expensive.

The greenhouse may be of either the span-roofed or lean-to type. It should be equipped with an efficient heating apparatus, a hot-water system being the best. Means of ventilating must be

[1] Abstract of a lecture given at The New York Botanical Garden, Saturday afternoon, January 19, 1929.

provided along the ridge and also along the sides, either by side-sashes or by box ventilators in the walls behind the pipes. The maintainance of an even night temperature is important. The day temperature may be allowed to rise five or ten degrees above the minimum before resorting to ventilation. Air should always be admitted at the top of the house first and on the leeward side. Later, if conditions warrant, the side ventilators may be opened. Avoid drafts and especially drafts of cold air.

A certain amount of humidity is necessary in the atmosphere, for few plants thrive in arid conditions. In an ordinary living room we can provide a plant with the correct temperature, right soil, sufficient moisture and light, but the air is too dry and this fact accounts for the early death of many plants purchased from the florist. Wet down the floors and the gravel on the benches between the pots each morning, and in warm weather again before sundown and possibly between times, as occasion may demand.

Watering is an important operation, calling for judgment and care. Unless a plant is dormant the soil requires to be kept pleasantly moist—neither too dry nor in a muddy condition. Examine the plants each morning on cold days, and morning and afternoon on warm days, and give water only to those requiring it. Rap the pot sharply with a piece of wood—a hollow ringing sound indicates a dry condition—a dull heavy response the opposite. Use water at the same temperature as the house and thoroughly soak the whole mass of soil at each application.

Some form of shading is necessary during bright weather, especially where such plants as ferns, palms, and Aspidistras are cultivated. This may be effected by painting some mixture on the glass, as the preparation "Summer Cloud" or by means of wood lath blinds. The latter method is preferable, as the blinds can be raised on dull days, or lowered just for an hour or two when the sunlight is strongest, as may be necessary.

Sanitation is of great importance in the greenhouse. No dead leaves, dirty pots, old canes, etc., should be left lying around. Once a week the pathways should be washed, and the whole greenhouse thoroughly cleaned at least once a year. If possible, remove all the plants and then scrub the glass and paintwork with hot water to which soap and some kerosene have been added.

Work from the top of the house downwards and thoroughly rinse with clear water as each section is completed. Choose a dull day for this task and if the plants have been removed and conditions permit burn some sulphur in the greenhouse to exterminate pests. If this cannot be done, fumigate with an approved fumigant. Take care that all the plants are free of insect pests before returning to the clean greenhouse.

Careful watch must be kept for insect and fungus pests, remembering that prevention is better than cure. Green fly (aphid) is easily destroyed by spraying or dipping in a solution of water and soap to which a little Black Leaf Forty has been added. This is also effective against red spider, thrip, and many other insects. White fly is quickly exterminated by the use of Cyanogas. When using this substance see that the house is air-tight. Keep the plants on the dry side with no moisture on the foliage. Moisten the paths at sunset and about half an hour later distribute the Cyanogas powder evenly over the moist paths using one fourth ounce for each 1000 cubic feet of air space. Lock the greenhouse doors to prevent any one from going in, for the toxic substance produced is the deadly hydrocyanic (prussic) acid gas. It is a good plan to use cyanide monthly as a preventive measure.

Loam, leaf mould, and sharp sand are the constituents used to form the soil composts used for greenhouse plants. If leaf-mold is not available, commercial humus may be substituted. These three substances mixed in correct proportions (so that the compost is open and friable) and just pleasantly moist, will suffice for seed-sowing and for potting young plants which do not require a rich soil. When potting older plants, shredded cow-manure and bone-meal may be added.

Many plants we grow in greenhouses are raised from seed, which may be sown in pots or shallow pans. To prepare the pot, first cover the drainage hole with an inch or more of broken crocks or coarse cinders, and on these place some rough leaves or fibrous loam to prevent the earth from clogging up the drainage. Now fill to within half an inch of the top with prepared soil passed through a sieve having a half inch mesh—the soil to be pressed down firmly but not packed hard. Water the pots thoroughly either by immersion or with the aid of a fine spray watering can and allow to drain for about one hour before sowing the

seed. Obtain good seed and sow thinly. Then cover with finely sifted soil to a depth equal to the diameter of the seed. Cover the pot with a sheet of glass and brown paper and place in a shaded part of the greenhouse. Examine it each morning. Probably no further watering will be required until the seedlings appear, but if the surface soil becomes dry immerse the pot nearly to the rim in a pail of water allowing the moisture to seep upwards to the surface. As soon as the seedlings appear, move to a light position but provide shade from bright sunshine for a few days.

Many plants, such as geraniums, cannot be raised each year from seed and these are usually propagated by means of cuttings. The cuttings of geraniums, ivy, and many other subjects are best made in early fall, while Lantanas, Heliotropes, Fuschias, etc., propagate more readily from cuttings of the young wood taken from old stock plants in the early spring. Use a keen knife for making cuttings. Select firm, healthy growths, carefully trim off the lower leaves and make a clean cut just below a joint. Insert the cuttings in a firm bed of sand, making sure that the base of the cutting touches the bottom of the hole made by the dibber. See that the cuttings are planted firmly and then give a good watering. Keep the propagating frame close and shaded until the cuttings are rooted, when they may be removed and potted up in the same manner as are seedlings. Many other methods of plant propagation are followed. Thus if single leaves of the popular Begonia Rex are cut across the intersections of the main veins and the leaf laid on the sand in the propagating case a new plant will arise at each incision. Ferns are increased by division. Old rubber plants, Dracaenas, etc., which have lost their lower leaves and become unsightly may be renovated by cutting half way through the stem just below the good leaves, placing a match-stick in the incision to keep it open, and then binding a good handful of moss around the stem where the cut is made. Keep the moss moist and in a short time roots will appear on its surface, when the top may be completely severed and potted up into the usual soil compost. The old stem, if cut into short lengths and placed in a propagating case where a little bottom heat is available, will supply several new plants. When feeding healthy plants which have filled their pots full of roots the

amateur is recommended to confine himself to dilute manure-water, soot-water, and proprietary artificials such as Clay's fertilizer. Such strong chemical manures as nitrate of soda, sulphate of ammonia, etc., are too dangerous for the inexperienced to use. Do not feed a sick plant. Try and make a diagnosis of the trouble and act accordingly. In many cases repotting into sweet soil will effect a change.

T. H. EVERETT.

PLEASANTVILLE, N. Y.

OBSERVATIONS ON A SHOT-HOLE DISEASE AND INSECT PESTS OF THE JAPANESE CHERRIES

"Cherry Valley" in the grounds of The New York Botanical Garden now contains about 100 trees large and small. The popularity of the Japanese cherry as an ornamental that can be grown in many sections of the United States is steadily increasing. Knowledge concerning the susceptibility of particular varieties to infestation by insect pests or fungous diseases becomes a subject of interest, and information regarding methods of control should be made available. This is especially true where there is any indication that the pest or disease may eventually become destructive.

"SHOT-HOLE" LEAF SPOT

The shot-hole effect frequently observed on leaves of our common cherries and peaches has been attributed to several different causes. Cherry shot-hole was once said to be due to a fungus *Cercospora circumscissa.* It is now known to be due to a species of *Cylindrosporium* of which the perfect stage is *Coccomyces hiemalis.* The peach leaf shot-hole disease, coming to be important economically in peach sections, has been proved to be due in large part to *Bacterium Pruni.* Federal pathologists have given this disease particular attention and have worked out a method of control which is soon to be published.

Winter injury and nitrate deficiency are also given as causing "shot-hole" and loss of leaves.

FIGURE 1, A. Shot-hole in leaves of a wild cherry caused by the resplendent shield-bearer, *Coptodisca splendoriferella* Clem. (Courtesy of Dr. E. J. Seaver). B, shot-hole leaf spot of Japanese cherry, probably

The insect *Coptodisca splendoriferella* destroys small areas of leaf tissue of cherries, leaving rows of holes along the midrib (FIGURE 1, a). Finally spray injury may result in a typical shot-hole effect. When, therefore, some of our Japanese cherries developed severe cases of shot-hole (FIGURE 1, b) about the middle of June, 1928, it became an interesting question to determine what might have been the cause of the trouble. Two of the trees most severely affected were in a vigorous condition of growth. New branches two or three feet long had already grown out. Masses of bacteria were found in some of the most recently formed spots. Two federal pathologists who examined specimens from these trees also found masses of bacteria and attributed the spotting to *Bacterium Pruni*. Since, however, it was later not always possible to find bacteria and as only rarely were fungi of various sorts found on the spots, the question arose whether the shot-hole effect might not be due to spray injury. Bacteria and non-pathogenic fungi might then come in secondarily.

The trees which first showed the spotting were among those which had been sprayed with 2 per cent. Volck, to which had been added 40 per cent. nicotine sulphate, 1 : 1600. Leaves which developed at the tips of branches after the spraying was done, later on developed very bad cases of shot-hole. Furthermore, other trees in this planting which had been sprayed the same day with Black-leaf-40, 1 : 800, and soap, 8 lbs. to 100 gallons of water, showed a great deal of shot-hole in August. Certain trees in the Brooklyn Botanic Garden grounds showed the same type of spotting in August, although these trees had never been sprayed since they were planted. One can, by increasing the percentage of the oil spray and nicotine sulphate used, cause spray injury, but the type of injury is readily distinguished from the shot-hole spotting.

The utter lack of agreement among a number of pathologists who examined these trees during the summer would indicate that the symptoms are not sufficiently marked or not yet well enough known to enable one to determine the cause of this trouble without the further evidence of infection experiments. It is planned to carry out such work next season with the hope of determining just what may be the cause of spotting and shot-hole of these Japanese cherries.

West Indian peach-scale—Aulacaspis pentagona

Dr. F. J. Seaver of the Garden staff has had the white scal on Japanese cherry under observation for a number of years He has gathered together, as the result of his studies and corre spondence, data on the occurrence of the insect and its economi importance. It is planned to publish an account covering thes details in another connection.

On May 1, when the writer took over the pathological work a The New York Botanical Garden, it was found that about 10 pe cent. of the scale insects had survived the three dormant spray of lime sulphur applied during February and March. The infes tation had been rather heavy on certain trees and it was eviden that summer control work would be necessary to prevent a further increase this year.

The season was rather late, so that the female scales did no begin to deposit their eggs until about June 7. By June 1 numbers of young had hatched out and were crawling over the branches. On June 16 about one half of the trees were sprayed with a 40 per cent. solution of nicotine sulphate, 1 : 800, to which fish-oil soap, 8 lbs. to 100 gallons, was added. The remainder of the trees were sprayed with Volck, 2 : 100, to which was added nicotine sulphate, 1 : 1600. This is probably about the upper limit of strength of such a mixture that could be used on these cherries without spray injury. Both spray mixtures were about equally effective in killing the crawlers. As a general thing it would probably be safer to use the nicotine sulphate and soap solution, or to reduce the Volck to 1 : 100.

It was to be expected that some eggs would hatch out after the application of June 16. On August 2, one tree showed a number of the long white scales of the male insects on branches harboring mature females. About August 10 a new brood began to hatch, so that by August 19 some branches were thickly covered with young insects that had settled down and begun to spin out long coiling elastic threads. These threads later flatten down and mass together to help make the protecting scales. This new infestation at first seemed not to be more extensive than was desirable to furnish hosts for certain scale parasites which it was hoped would become established. If it had been necessary to make a second summer application of nicotine sulphate and soap,

the trees should have been sprayed about August 13 this year, or before the insects had begun to spin out the protecting thread masses.

Several different insecticides were tried out experimentally on small branches between August 20 and September 11 but without much effect. On the latter date, a 2½ per cent. Volck solution was being used for woolly aphids on Crataegus. At this time an inspection of the Japanese cherries showed 60 of the large trees were entirely free from scale. There were also many younger trees which had no scale. Ten trees showed some scale on at least one or two branches. Several large branches on three other trees were well covered with insects of the second brood. These 13 trees were sprayed on September 11 with the 2½ per cent. Volck solution, under a pressure of 300 lbs. Many male scales were knocked off and some killing of those remaining resulted. It is clear, however, that if lime sulphur or a miscible oil is applied at dormant strength just before the buds swell in the spring, the hatch from the surviving insects can be controlled by nicotine sulphate and whale-oil soap, applied at the time the young are crawling. This would probably be about June 7 here at New York in normal seasons. If a second brood should hatch they should be looked for during the first week or weeks in August.

Leaf-eating insects

Three species of slug caterpillars were found feeding on the Japanese cherries in September. *Parasa fraterna,* a brown spiny caterpillar, and *Adoneta spinuloides* were frequently found parasitized by insects whose white cases were being carried by the caterpillars. The parasites were evidently keeping these leaf-eaters under control. The third species, *Prolimacodes scapha,* the "Beechnut box," was not numerous at any time. These slug caterpillars are said to be general feeders and not particularly attracted to cherries.

The fall web-worms infested two small trees and caused some defoliation before they were discovered on September 14.

With the exception of the West Indian peach-scale noted, our Japanese cherries seem to be little troubled by insect pests.

B. O. Dodge.

FRANKLIN SUMNER EARLE

Franklin Sumner Earle was born in Dwight, Illinois, September 4, 1856, and died in Herradura, Cuba, January 31, 1929. In 1872 he entered the University of Illinois and, after some general studies, specialized along botanical and biological lines. He did not graduate, but for many years returned at intervals to work with Dr. T. J. Burrill. When Dr. Burrill discovered the causal relation between certain bacteria and certain plant diseases, Mr. Earle was working in his laboratory and assisted in the important investigations and tests which were made at that time. While at the University of Illinois, he began his mycological studies and, as joint author with Dr. Burrill, published The Erysiphaceae of Illinois, his first important mycological publication.

At this time, as throughout the greater part of his life, practical work in field and orchard alternated with technical studies, and gave his mind a notably firm grasp of the economic aspects frequently presented by botanical problems. He disliked the tendency to draw a line between pure and applied science, believing that all proved and accurate knowledge ultimately contributes to human welfare. With this outlook, while keeping up his strictly mycological work, he was connected with the Mississippi Agricultural Experiment Station from 1892 to 1895. As joint author with S. M. Tracy, he published Mississippi Fungi in 1895. In 1895–96 he was with the United States Department of Agriculture, as Assistant Pathologist in charge of the mycological herbarium. In 1896 he went to the Alabama Agricultural Experiment Station as Horticulturist, and from 1896 1901 he was with the Alabama Polytechnic Institute as Professor of Biology. In 1897, as joint author with Dr. L. M. Underwood, he published A Preliminary List of Alabama Fungi.

In 1901 Mr. Earle accepted a position as Assistant Curator in charge of the mycological collections at The New York Botanical Garden, remaining until 1904. A mission to Jamaica, where he was sent by the Botanical Garden to investigate a disease of the logwood, interrupted the routine of his mycological work, and was the beginning of his interest in tropical agriculture.

In 1904, when the newly established Republic of Cuba asked the United States Department of Agriculture to name some one qualified to organize an agricultural experiment station and act

as its director, Mr. Earle was recommended, and accepted appointment as Director of the Estación Central Agronómica de Cuba, at Santiago de las Vegas, near Havana. Here he quickly organized an efficient staff and from 1904 to 1906 directed many investigations of importance to the island. Those who were members of the Estación staff at this time look back upon those years as a particularly stimulating experience. They had entered a field almost untouched before by scientific agriculture and, under Mr. Earle's leadership, their pioneering was done without waste of effort, with great enthusiasm, and with a particularly notable good will. While helping to plan and keeping up a constant interest in all the work undertaken by his staff, Mr. Earle did not drop his mycological work and was able to complete some important studies.

His work at the Estación Central Agronómica convinced him that the most important agricultural problem in Cuba and in similar regions, was the improvement of field methods in cane production and the discovery or production of better cane varieties, and after leaving the Estación he acted as agricultural adviser to various large sugar interests in Cuba. In 1918 the mosaic disease of sugar cane began to spread so rapidly in Porto Rico that the United States Department of Agriculture sent Mr Earle there to study means of combatting it. He formulated a system for the treatment of seed cane to prevent the spread of the disease and discovered the immunity of certain canes to the mosaic and urged their planting instead of the susceptible kinds. This intensified his interest in cane varieties. He made a far-reaching study of them and, after some further work in advising private sugar interests, in 1924 he took charge of work with cane varieties for the Tropical Research Foundation in Cuba, continuing the work until a short time before his death. His book on "Sugar Cane and its Culture," which appeared in 1928, is a fitting summary of his activities in this field.

During these years of intense application to cane problems, his interest in mycology remained vivid; but in 1918 his collections and all of his scientific notes, writings, and materials were lost in a fire which destroyed his home. This loss, and the fact that his eyes were no longer equal to close microscope work, put an end to his active contributions to mycology, but he followed the

work of others with close attention and remained one of the associate editors of *Mycologia.*

Not only as a scientist of remarkably quick and clear vision, but as a man whose personal qualities commanded the warmest admiration, his loss will be felt by a very wide circle of associates.

MARY TRACY HORNE.

EARLE'S SUGAR CANE AND ITS CULTURE[1]

So much has been written about the technical processes of sugar milling and manufacture that it is refreshing to find a book devoted exclusively to the production of sugar cane. Professor Earle treats in detail the history, botany, varieties, and diseases of sugar cane. He also treats more briefly the subjects of growing new varieties from seed, and of field culture, giving a very practical discussion of the reasons for the merits of the different systems of cane culture.

His chapters on varieties and diseases are particularly detailed and commendable. He recognizes four great groups: (1) the Noble Canes, *Saccharum officinarum,* which are heavy-growing tropical sorts, susceptible to many diseases. The Otheite was the outstanding cane of this group in the early development of sugar growing and Crystallina is the most widely planted today; (2) the Chinese Canes, *S. sinense,* slender sorts of which Uba is an example. These are quite resistant to mosaic disease; (3) the Indian Cane hybrids, derived from *S. Barberi* from Northern India; and (4) the *Saccharum spontaneum* hybrids, derived from crosses between that wild species and the cultivated varieties. These are promising because of their great disease-resistance. The large number of hybrid varieties distributed under number, and their importance in the sugar industry is surprising. Earle has worked out an excellent system of describing the sugar cane varieties by botanical characters of the vegetative parts, and devotes considerable space to careful varietal descriptions.

The book is well edited, the information in it easily accessible, and the illustrations are clear and informing. All in all, it is an

[1] Earle, F. S. Sugar Cane and its Culture. 8vo, cloth, pp. 355, text figs. 24 John Wiley & Sons, New York, 1928.

excellent guide for the sugar investigator and for the thoughtful planter. It is gratifying to know that the lamented author was privileged to see finished copies of this book, doubtless his "magnum opus," a few weeks before his recent death.

FORMAN T. MCLEAN.

A GLADIOLUS SOCIETY BEING ORGANIZED FOR NEW YORK CITY

Some of the finest gladiolus shows anywhere in the world were held in New York a few years ago. For the past four years the big midsummer shows of gladiolus have been at Boston, Hartford, and elsewhere. With the growing interest in suburban gardens and flowers, there is an opportunity again to make New York a center of gladiolus interest.

Accordingly, a gladiolus society with headquarters in New York City, and working in coöperation with the American Gladiolus Society and the New York Horticultural Society, is being organized. The purpose of it is to stimulate interest in and diffuse information about the culture and uses of the gladiolus. It is proposed to secure the monthly *Gladiolus Review* for each of the members; to keep members informed about national activities and newer developments; to hold monthly meetings during the winter months; an early-autumn suburban flower show, featuring gladiolus; and to notify the members of timely matters, such as handsome displays, cultural hints, etc., by occasional bulletins. The cost of membership is placed at two dollars a year, and it is proposed to hold the first meeting as soon as fifty charter members are secured. There are now about thirty enrolled.

The gladiolus collection at The New York Botanical Garden is being increased this season by the addition of a large number of new varieties being furnished by commercial growers from all parts of the country, so that there will be an excellent opportunity here to see and compare the varieties of each color. They will be arranged by colors and by classes into Large-flowered, Primulinus, and Primulinus Grandiflorus types.

The collection of winter-flowering wild species of gladiolus and the fragrant hybrids have been blooming freely in Conservatory

Range 2 this winter, and a few of the hardier of them are planted in the Rock Garden, where they are expected to flower in June. Water-color paintings of a number of these odd forms of gladiolus species are being made by Miss Eaton, for record and for later publication.

FORMAN T. MCLEAN.

PUBLICATIONS OF THE STAFF, SCHOLARS, AND STUDENTS OF THE NEW YORK BOTANICAL GARDEN DURING THE YEAR 1928

Alexander, E. J. *Uva-ursi Uva-ursi.* Addisonia **13**: 3, 4. *pl. 418*; *Verbena hastata.* 11, 12. *pl. 422.* 14 Ap 1928; *Azalea calendulacea.* 17, 18. *pl. 425*; *Helonias bullata.* 23, 24. *pl. 428*; *Cajan Cajan.* 31, 32. *pl. 432.* 11 Jl 1928.

Barnhart, J. H. Lewis Henry Lighthipe. Torreya **28**: 13, 14. Ja F 1928.

—— ——. [Biographical notes.] Jour. N. Y. Bot. Gard. **29**: Thomas Nuttall (1786 1859). 2; James Graham Cooper (1798–1864). 4; Abram Paschall Garber (1838–1881). 4; William Bartram (1739–1823). 6. Ja 1928; Thomas Walter (1740–1789). 149; Mark Catesby (1679–1749). 149; Edmund Bohun (1672–1734). 150; John Bartram 1699–1777). 150; John Fraser (1750–1811). 150; André Michaux (1746–1802). 150, 151; Hernando de Soto (about 1496–1542). 151; Juan Ponce de León (about 1460–1521). 153; Hernando de Escalante Fontaneda (about 1538– ?). 153; Alvar Nuñez Cabeza de Vaca (about 1490–about 1564). 153, 154; Jonathan Dickenson (about 1654–1722). 154, 155. Jl 1928.

———. Report of the Bibliographer (for 1927). Bull. N. Y. Bot. Gard. **13**: 282, 283. 31 My 1928.

Bowers, C. G. Azaleas at the flower show. Jour. N. Y. Bot. Gard. **29**: 105–108. My 1928.

Boynton, K. R. Chrysanthemums (1927). Jour. N. Y. Bot. Gard. **29**: 11–13. *f. 4.* Ja 1928.

———. Plants that are attractive in fruit. Jour. N. Y. Bot. Gard. **29**: 70, 71. Mr 1928. [Abstract of lecture.]

———. *Erlangia tomentosa.* Addisonia **13**: 1, 2. *pl. 417*; *Buddleia asiatica.* 5, 6. *pl. 419*; *Viburnum Carlesii.* 9, 10. *pl. 421*; *Trachymene coerulea.* 13, 14. *pl. 423*; *Ligularia Kaempferi aureomaculata.* 15, 16. *pl. 424.* 14 Ap 1928; *Congea tomentosa.* 19, 20. *pl. 426*; *Salix caprea elliptica.* 27. *pl. 430*; *Grewia parviflora.* 29. *pl. 431.* 11 Jl 1928.

———. Report of the Head Gardener (1927). Bull. N. Y. Bot. Gard. **13**: 266–272. 31 My 1928.

———. Tulips planted in 1928. Jour. N. Y. Bot. Gard. **29**: 299–302. D 1928.

———. The chocolate tree fruiting under glass. Jour. N. Y. Bot. Gard. **29**: 306. *f. 1.* D 1928.

Britton, E. G. Report of the Honorary Curator of Mosses (1927). Bull. N. Y. Bot. Gard. **13**: 313, 314. 31 My 1928.

———. Canada geese of the Bronx. Bird-Lore. **30**: 260, 261. Jl-Au 1928. [Illust.]

———. The Japanese beetle. Torreya **29**: 107, 108. N–D 1928. [Illust.]

———. Fringed gentian. [Illust.] [Unpaged leaflet, New York, 1928.]

Britton, N. L. Dr. W. Gilman Thompson. Jour. N. Y. Bot. Gard. **29**: 13, 14. Ja 1928.

———. Resolutions relative to the services of Doctor Frederic S. Lee to The New York Botanical Garden. Jour. N. Y. Bot. Gard. **29**: 42, 43. F 1928.

———. Forestry and agriculture in Porto Rico. Jour. N. Y. Bot. Gard. **29**: 101–104. My 1928.

———. Report of the Secretary and Director-in-Chief for the year 1927. Bull. N. Y. Bot. Gard. **13**: 257–260. 31 My 1928.

———. The John Innes Kane fund. Jour. N. Y. Bot. Gard. **29**: 210, 211. Au 1928.

———. Bequest of the Burgess collection of asters. Jour. N. Y. Bot. Gard. **29**: 267, 268. O 1928.

———. The herbarium of Eugene A. Rau. Jour. N. Y. Bot. Gard. **29**: 284, 285. N 1928.

———. *Ipomoea polyanthes.* Addisonia **13**: 49. *pl. 441*; *Jussiaea angustifolia.* 51. *pl. 442*; *Tetrazygia elaeagnoides.* 53. *pl. 443*; *Chamaecrista Swartzii.* 55. *pl. 444*; *Columnea*

Tulae. 57. *pl. 445*; *Rubus rosaefolius.* 59. *pl. 446*; *Volkameria aculeata.* 61. *pl. 447*; *Pentarhaphia albiflora.* 63. *pl. 448.* 31 D 1928.

Britton, N. L., & Rose, J. N. (Rosales) Mimosaceae. N. A. Fl. **23**: 1–76. 11 F 1928; 77–136. 25 S 1928; 137-194. 20 D 1928.

Chandler, C., with **Stout, A. B.** Report of 1927 Iris breeding experiments at The New York Botanical Garden. Bull. Am. Iris Soc. No. **27**: 31–49. Ap 1928.

Denslow, H. M. Brief notes on local plants. Torreya **27**: 105. 7 Ja 1928.

———. Report of the Honorary Custodian of the Local Herbarium (for 1927). Bull. N. Y. Bot. Gard. **13**: 315. 31 My 1928.

Dodge, B. O. Unisexual conidia from bisexual mycelia. Mycologia **20**: 226 234. *f. 1.* 1 Jl 1928.

Fulling, E. H. The Imperial gardens at Schönbrunn. Jour. N. Y. Bot. Gard. **29**: 61–70. *f. 2.* Mr 1928.

———. The Hunnewell estate. Jour. N. Y. Bot. Gard. **29**: 262–266. O 1928.

———. A recataloguing of the pinetum. Jour. N. Y. Bot. Gard. **29**: 273–277. N 1928.

Gleason, H. A. *Miconia minutiflora* and allied species. Bull. Torrey Club **55**: 117, 118. Mr 1928.

———. The flora of the Chicago area. Torreya **28**: 6–9. Ja-F 1928 [Review].

———. Two recent books on the vegetation of Switzerland. Torreya **28**: 9, 10. Ja F 1928 [Review].

———. Colorado plant life. Torreya **28**: 29, 30. Mr-Ap 1928 [Review].

———, with **Cook, M. T.** Ecological survey of the flora of Porto Rico. Jour. Dep. Agr. Porto Rico **12**: 3–139. *f. 1–75.* Jl 1928.

Harlow, S. H. Report of the Librarian (for 1927). Bull. N. Y. Bot. Gard. **13**: 284, 285. 31 My 1928.

Hollick, A. Report of the Paleobotanist. Bull. N. Y. Bot. Gard. **13**: 309–311. 31 My 1928.

——— . A white oak killed by lightning. Jour. N. Y. Bot. Gard. **29**: 179–182. *f. 7.* Jl 1928.

———. *Isotria verticillata* on Staten Island. Torreya **28**: 69, 70. *pl. A, B.* Jl-Au 1928.

———. Paleobotany of Porto Rico. Scientific survey of Porto Rico and the Virgin Islands 7: 177–394. *pl. 51 88.* 31 O 1928.

———. Story of the redwoods. Jour. N. Y. Bot. Gard. **29**: 281, 282. N 1928 [Abstract of lecture].

Howe, M. A. Miss Annie Lorenz. Torreya **28**: 11–13. 23 F 1928.

———. Notes on some marine algae from Brazil and Barbados. Jour. Washington Acad. Sci. **18**: 186–194. *f. 1, 2.* 4 Ap 1928.

———. Dr. Small's coöperation with Mr. Edison. Jour. N. Y. Bot. Gard. **29**: 92, 93. *f. 4.* Ap 1928.

———. The Mrs. A. Sherman Hoyt collection of living desert plants. Jour. N. Y. Bot. Gard. 29: 108–111. *f. 1, 2.* My 1928.

———. Ornamental plants of the sea. Jour. N. Y. Bot. Gard. **29**: 136, 137. Je 1928 [Abstract of lecture].

———. The 1928 dahlia collection. Jour. N. Y. Bot. Gard. 29: 211, 212. Au 1928.

———. Joseph Edward Kirkwood. Jour. N. Y. Bot. Gard. 29: 266, 267. O 1928.

———. Edward Sandford Burgess. Bull. Torrey Club **55**: 433 440. *portrait.* O 1928.

Mackenzie, K. K. The grass genus *Digitaria.* Rhodora 30: 49–52. Mr 1928.

———. White-fruited baneberries. Torreya **28**: 51–53. My-Je 1928.

———. *Solidago petiolata* Miller and some other golden rods Torreya **28**: 95–99. S O 1928.

———. *Solidago flexicaulis* and *Solidago latifolia.* Rhodora 30: 223, 224. N 1928.

———. The identification of Linnaean species. Rhodora 30: 232 237. D 1928.

McLean, F. T. Gladiolus, wild and cultivated. Jour. N. Y. Bot. Gard. **29**: 125–130. Je 1928. [Abstract of lecture.]

———. List of gladiolus grown at The New York Botanical Garden. Jour. N. Y. Bot. Gard. **29**: 239–243. S 1928.

———. Students and teachers of all ages visit The New York Botanical Garden. Jour. N. Y. Bot. Gard. **29**: 302–304. D 1928.

Mitchell, P. de C. Visit of a distinguished student of willows. Jour. N. Y. Bot. Gard. **29**: 243, 244. S 1928.

Peckham, E. A. S. Flowery edges to vegetable plots. Garden and Home Builder **47**: 154, 194. Ap 1928.

———. Farming for bouquets on the Côte d'Azur. Jour. N. Y. Bot. Gard. **29**: 130–135. *f. 1–4.* Je 1928. [Abstract of lecture.]

———. Rock gardening without a rockery. Garden and Home Builder **47**: 462, 463. Jl 1928.

———. Our own elysian fields. Garden and Home Builder **47**: 538–540. Au 1928.

———. Naturalizing bulbs. Jour. N. Y. Bot. Gard. **29**: 217–222. *f. 1–3.* S 1929.

———. Summer's green all girded up in sheaves. Garden and Home Builder **47**: 613. S 1928.

Rusby, H. H. Bureaucracy, regulations, and the law. Practical Druggist **34**: 19. F 1928.

———. The legal standards for ergot and its fluid extract. N. Y. State Jour. of Medicine. Mr 1928.

———. .A résumé of ergot. The Messenger **5**: 66. Ap 1928.

———. The boycott of Spanish ergot. Jour. Am. Phar. Assoc. **17**: 349. Ap 1928.

———. Mulfordia, a new genus of the Zingiberaceae. Bull. Torrey Club **55**: 165, 166. *f. 1–6.* Ap 1928.

———. Report of the Honorary Curator of the Economic Collections for the year 1927. Bull. N. Y. Bot. Gard. **13**: 312. 31 My 1928.

— ——. An address of welcome to visitors from Germany. The Messenger **5**: 113. Jl 1928.

———. Dean's address to the graduating class. The Messenger **5**: 132–135. Jl 1928.

———. Report of the Dean [College of Pharmacy] for the academic year ending June 30, 1928. 1–4. Jl 1928.

———. Ergot, additional evidence on comparative quality of Russian and Spanish. The Messenger **5**: 158. Au 1928.

———. Barrett's "The tropical crops." Jour. N. Y. Bot. Gard. 29: 285–287. N 1928. [Review.]

———. An important question of pharmacopoeial interpretation. Jour. Am. Phar. Assoc. 17: 1076. 1928.

Rydberg, P. A. Genera of North American Fabaceae—III. Tribe Psoraleae. Am. Jour. Bot. 15: 195-203. *pl. 12, 13.* 27 Mr 1928;—IV. Tribe Psoraleae (continued) 15: 425-432. *pl. 26–28.* 28 My 1928.

———. Notes on Fabaceae—X. Bull. Torrey Club 55: 119–132. Mr 1928; XI. 155–164. Ap 1928.

———. *Sedum ternatum.* Addisonia 13: 21, 22. *pl. 427.* 11 Jl 1928.

———. Life zones in the Rocky Mountains. Jour. N. Y. Bot. Gard. 29: 282–284. N 1928. [Abstract of lecture.]

Seaver, F. J. Some insect enemies of the ash. Tree Talk 8: 10–14. Spring 1928. [Illust.]

———. Studies in tropical Ascomycetes—IV. Some Hypocreales from Trinidad. Mycologia 20: 52–59. *pl. 8–12.* 1 Mr 1928;—V. Species of Phyllachora. 20: 214 225. *pl. 23–28.* 1 Jl 1928.

———. Doctor Arthur's rust work. Mycologia 20: 115, 116. *pl. 14* (portrait). 1 My 1928.

———. Notes and brief articles. Mycologia 20: *Calostilbe striispora.* 248; The North American cup-fungi. 248; Gäuman's comparative morphology of fungi. 249. Jl 1928.

———. The North American cup-fungi. (Operculates) i–vii + 1–284. *pl. 1–46.* 30 D 1928. New York.

Small, J. K. The royal palm—*Roystonea regia.* Jour. N. Y. Bot. Gard. 29: 1–9. *f. 1–3.* Ja 1928.

———. A new deerberry from the gulf region. Torreya 28: 5. Ja-F 1928.

———. A new Chamaesyce from the Florida keys. Torreya 28: 6. Ja-F 1928.

— ———. Report of the Head Curator of the Museums and Herbarium (for 1927). Bull. N. Y. Bot. Gard. 13: 261–265. 31 My 1928.

———. Botanical fields, historic and prehistoric. Jour. N. Y. Bot. Gard. 29: 149–179. *f. 1 6.* Jl 1928; 185–209. *f. 7-11.* Au 1928; 223–235. *f. 12–14.* S 1928.

———. *Nothoscordium fragrans.* Addisonia **13**: 33, 34. *pl. 433*; *Monotropa Brittonii.* 35, 36. *pl. 434*; *Gelsemium Rankinii.* 37, 38. *pl. 435*; *Maytenus phyllanthoides.* 39, 40. *pl. 436*; *Bletia purpurea.* 41, 42. *pl. 437*; *Ipomoea macrorhiza.* 43, 44. *pl. 438*; *Platypus altus.* 45, 46. *pl. 439*; *Psychotria Sulzneri* 47, 48. *pl. 440.* 3 O 1928.

———. The 'everglades. The Scientific Monthly **28**: 80–87. D 1928. ["Ja 1929."] [Illust.]

Stout, A. B. Conference notes for November (1927). Jour. N. Y. Bot. Gard. **29**: 14, 15;—for December (1927). **29**: 15, 16. Ja 1928.

———. The bulbs and bulb habits of lilies. Jour. N. Y. Bot. Gard. **29**: 25 42. *f. 1–6.* F 1928.

——— . Dichogamy in flowering plants. Bull. Torrey Club **53**: 141–153. *f. 1 5.* Ap 1928.

——— . Report of the Director of the Laboratories for the year 1927. Bull. N. Y. Bot. Gard. **13**: 278–281. 31 My 1928.

———. A new hardy seedless grape. Jour. Heredity **19**: 316–323. *f. 7–10.* Jl 1928.

———. Lilies. Yearbook Hort. Soc. N. Y. **1927**: 20–33. *Colored frontispiece + pl. 1–5.* 1928.

———. Annual report of the work of the lily disease investigation committee. Yearbook Hort. Soc. N. Y. **1927**: 112–114. 1928.

———, with **Chandler, C.** Report of 1927 Iris breeding experiments at the New York Botanical Garden. Bull. Am. Iris Soc. No. **27**: 31–49. Ap 1928.

Williams, R. S. *Oxyrrhynchium Rappii* sp. nov. Bryologist **30**: 102. *pl. 8* "N 1927." [31 Ja 1928.]

———. Report of the President (for 1927) [Sullivant Moss Society]. Bryologist **31**: 20. 15 Mr 1928.

———. *Orthotrichum Macfaddenae* n. sp. Bryologist **31**: 52. *pl. 5.* 8 Je 1928.

———. *Sphaerothecium* Hampe—a good genus. Bryologist **31**: 72. *pl. 7.* 30 O 1928.

Wilson, P. Two new species of Portulaca from Mexico. Torreya **28**: 28, 29. Mr-Ap 1928.

——— –. *Basella rubra.* Addisonia **13**: 7. *pl. 420.* 14 Ap 1928.

NOTES, NEWS, AND COMMENT

Dr. John K. Small, Head Curator of the Museums and Herbarium, left New York on March 6 to continue his botanical explorations of Florida and the coastal region of some of the Gulf States.

Dr. N. L. Britton, Director-in-Chief, and Mrs. N. L. Britton, Honorary Curator of Mosses, returned to New York on March 25, after devoting three months to a continuation of their studies of the flora of Porto Rico.

In addition to numerous members of the Botanical Society of America in attendance upon the annual meeting, the following visiting botanists have registered in the library during the winter months: Prof. M. A. Chrysler, New Brunswick, N. J.; Mr. Erling Dorf, Princeton, N. J.; Prof. F. D. Fromme, Morgantown, W. Va.; Prof. G. J. Peirce, Stanford University, Cal.; Mr. R. O. Williams, Royal Botanic Gardens, Trinidad; Prof. Carlos Crespi, Ecuador; Prof. Albert N. Steward, University of Nanking; and Dr. Yoshitade Yabe, Tokyo, Japan.

The United States Department of Agriculture announces that experiments in New Jersey indicate that Japanese beetles feeding upon geraniums (Pelargonium sp.) are often paralyzed and killed thereby, that the poison has its best development when the geraniums are grown in full sunlight, and that the flowers are somewhat more poisonous than the foliage. It has been known for some time that geraniol, an oil that occurs in geraniums and certain other plants, is very effective in attracting the beetles, and this bait has been used to concentrate beetles on a single tree where they have been killed by the more usual poisons. It now appears that in twenty-four hours after death by geranium poisoning the entire digestive system of the beetle is destroyed. Further investigations, looking to the development of a new and better poison from geraniums than any now in use for controlling the Japanese beetle, are suggested.

At the monthly Conference of the Staff and Registered Students of the Garden for February, held on the afternoon of the

13th, Dr. B. O. Dodge discussed "The Production of Inter-specific Hybrids in Fungi." The report was a complete summary of Dr. Dodge's researches in hybridizing certain species of *Neurospora,* which constitute the first and thus far the only successful production under experimental control of inter-specific hybrids among fungi. The methods of work were explained and the hybrids obtained were discussed especially with reference to the hereditary behavior of the haploid generation. Cultures and microscopic mounts were displayed for demonstration.

The snowdrops are in bloom in sheltered places under shrubbery and along the borders south and west of the Museum Building at The New York Botanical Garden. A common variety of snowdrop, with its white petals and green markings down the center, comes from Southern Europe and is found in the mountains from the Pyrenees to the Caucasus. This doesn't mean, of course, that the cold weather is over, for the first of the snowdrops quite regularly get their noses nipped in the springtime. These dainty little nodding blossoms are always welcome as the first sign of the spring flowering season. There are several other kinds of snowdrops cultivated. The giant snowdrop from the mountains of Asia Minor is one of the handsomest and there are ten other interesting little species related to these. They all resemble one another so much that most of them would be classed simply as snowdrops by the average gardener. Some of the garden varieties grown in Europe have pure white blossoms. All are natives of south-eastern Europe. They may be naturalized in groups in the grass and are specially happy in sheltered places on the south side of the house. These little fall-planted bulbs are an asset to any garden arrangement. *Forman T. McLean (March 9).*

Meteorology for February. The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: 43° on the 3rd; 52° on the 7th; 55½° on the 17th; 58° on the 18th, and *59° on the 27th.* The minimum temperatures recorded were: 14° on the 5th; 15° on the 13th and 14th, and *13° on the 21st.* The total precipitation for the month was 4.11 inches, .60 of which was figured from 6 in. snow measurement.

ACCESSIONS

LIBRARY ACCESSIONS FROM NOVEMBER 1, 1928, TO FEBRUARY 28, 1929

ABERCROMBIE, JOHN. *Practical gardener and improved system of modern horticulture, alphabetically arranged.* Ed. 4. London, 1834.

BARTHOLOMEW, ELAM. *Handbook of the North American Uredinales, including citations and synonymy.* Stockton, 1928.

BAUMBERGER, ERNST, & MENZEL, PAUL JULIUS. *Beitrag zur Kenntniss der Tertiärflora aus dem Gebiete des vierwaldstätter Sees.* Genève, 1914.

BRIGHT, HENRY A. *A year in a Lancashire garden* London, 1891.

———. *The English flower garden with illustrative notes.* London, 1881.

BURBIDGE, FREDERICK WILLIAM THOMAS. *Domestic floriculture.* Edinburgh, 1874.

———. Ed. 2. Edinburgh, 1875.

CHASE BROTHERS COMPANY. *Chase fruit and flowers in natural colors.* Rochester, c 1922.

CORREA, PIO. *Diccionario das plantas uteis do Brasil e das exoticas cultivadas.* Vol. 1. Rio de Janeiro, 1926. (Given by Dr. N. L. Britton.)

CUSHING, JOHN. *The exotic gardener.* Ed. 2. London, 1814.

DELAMER, EUGENE SEBASTIAN. *The kitchen & flower garden; or, the culture in the open ground of roots, vegetables, herbs, & fruits.* London, 1856.

DONN, JAMES. *Hortus cantabrigiensis.* Ed. 10, with numerous additions and corrections by John Lindley. London, 1823.

DRUERY, CHARLES THOMAS. *The book of British ferns.* London, n. d.

DU BUYSSON, ROBERT. *Monographie des cryptogames vasculaires d'Europe.* Moulins, 1890.

EARLE, MARIA THERESA. *A third pot-pourri* London, 1903.

———. *More pot-pourri, from a Surrey garden.* 3rd impression. London, 1899.

———. *Pot-pourri from a Surrey garden.* Ed. 24. London, 1900.

ELLACOMBE, HENRY NICHOLSON. *In my vicarage garden and elsewhere.* London, 1902.

EMERSON, ARTHUR IRVING, & WEED, CLARENCE MOORES. *Our trees: how to know them.* Ed. 5. Philadelphia, 1918.

ETTINGSHAUSEN, CONSTANTIN VON. *Die fossile Flora von Schoenegg bei Wies in Steiermark* 2 parts. [Wien] 1890–91.

FISCHER, HERMANN. *Mittelalterliche Pflanzenkunde.* München, 1929.

FRIEDRICH, PAUL ALEXANDER. *Beiträge zur Kenntniss der Tertiärflora der Provinz Sachsen.* 2 vols., text and atlas. Berlin, 1883.

GARCIÁ, EVARISTO. *Los ofidios venenosos del Cauca.* Cali, 1896. (Given by Dr. Rafael Toro.)

HENRY, JOSEPH KAYE. *Flora of southern British Columbia and Vancouver island, with many references to Alaska and northern species.* Toronto, c 1915. (Given by Dr. J. H. Barnhart.)

JOHNSON, CHARLES. *The ferns of Great Britain: illustrated by John E. Sowerby.* London, 1859.

JONES, DONALD FORSHA *Selective fertilization.* Chicago, c 1928.

LENZ, FRIEDRICH. *Einführung in die Biologie der Süsswasserseen.* Berlin, 1928.

LINTON, WILLIAM JAMES. *The ferns of the English Lake country.* Ed. 2. Windermere, 1878.

LOWE, EDWARD JOSEPH. *British ferns, and where found.* London, 1890.

———. *Fern growing; fifty years' experience in crossing and cultivation.* New York, 1898.

MOLDENKE, CHARLES EDWARD. *Ueber die in altägyptischen Texten erwähnten Bäume und deren Verwerthung.* Leipzig, 1886. (Given by the author.)

PAOLUCCI, LUIGI. *Nuovi materiali e richerche critiche sulle piante fossili terziarie dei gessi di Ancona.* Ancona, 1896.

ROCKWELL, FREDERICK FRYE *The home garden handbooks; irises.* New York, 1928. (Given by Mrs. Wheeler H. Peckham.)

SCHUSTER, JULIUS. *Monographie der fossilen Flora der Pithecanthropus-Schichten.* München, 1911.

SIM, THOMAS ROBERTSON. *Handbook of the Bryophyta of South Africa.* n. p., 1916. (Given by Mr. A. T. Beals.)

SMITH, A. M. DEW-. *Confidences of an amateur gardener.* London, [1897].

WEBER, CARL ALBERT. *Die Mammutflora von Borna.* [Bremen, 1913–14.]

WILES, ROBERT. *Cuban cane sugar.* Indianapolis, 1916. (Given by Mrs. N. L. Britton.)

WOOD, ALPHONSO *A class-book of botany.* Ed. 10. Claremont, 1850. (Given by Mr. W. W. Eggleston.)

———. Ed. 29. Boston, 1853. (Given by Mr. W. W. Eggleston.)

ZWANZIGER, GUSTAV ADOLF. *Beiträge zur Miocänflora von Liescha.* [Klagenfurt, 1878.]

PUBLICATIONS OF

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Vol. VI. Papers presented at the Celebration of the Twentieth Anniversary of The New York Botanical Garden. viii + 594 pp., with 43 plates and many text figures. 1916.

Vol. VII. Includes New Myxophyceae from Porto Rico, by N. L. Gardner; The Flower Behavior of Avocados, by A. B. Stout; Descriptions of New Genera and Species of Plants Collected on the Mulford Biological Exploration of the Amazon Valley, 1921–1922, by H. H. Rusby; and The Flora of the Saint Eugene Silts, Kootenay Valley, British Columbia, by Arthur Hollick. viii + 464 pp., with 47 plates, 10 charts, and 11 text-figures. 1927.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. In the thirteenth volume.

THE NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

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FURTHER STUDIES IN PORTO RICO

TO THE SCIENTIFIC DIRECTORS OF THE NEW YORK BOTANICAL GARDEN:

Gentlemen: Pursuant to permission by the Board of Managers, I was absent from the Garden from December 20, 1928, to March 25, 1929, occupied, with Mrs. Britton, in continuation of studies of tropical plants and the collecting of botanical specimens for the Garden herbarium; also, as Chairman of the Committee of the New York Academy of Sciences on the Scientific Survey of Porto Rico and the Virgin Islands, an investigation which has been in progress for several years, much attention was given to botany, horticulture, geology, and zoology, in coöperation with scientific officials of the government and with many interested citizens.

Arriving in Porto Rico toward the end of December, we were able to study the characteristic vegetation of the arid regions of the southwestern districts before the rainy season was over, and were delighted to find these nearly desert regions luxuriantly green, with many kinds of plants in flower, enabling us to obtain excellent desirable specimens, to amplify hitherto incomplete descriptions of them, and to increase knowledge of local geographic distribution. Two of the most elegant floral features of these arid districts in January and February are *Anneslia haematostoma,* a rare and local shrub of the Mimosa Family, with conspicuous clusters of small blood-red flowers and *Peiranisia polyphylla,* a shrub of the Cassia Family with large, bright yellow flowers, very abundant and turning the landscape golden over large areas.

To these districts, and to many other localities, we were accompanied by Mrs. Frances W. Horne, whose noteworthy work in water-color painting of native Porto Rico plants we have taken advantage of in "Addisonia," twenty-seven of these elegant and accurate portrayals having already been reproduced in that journal from time to time; Mrs. Horne's very important collection of these paintings now include about two hundred and fifty species, by far the largest one ever made of West Indian plants. During our visit, about fifty subjects were secured, and eight of them selected for future use in "Addisonia." The arid southwestern districts yielded many of these additions, and several especially interesting ones were obtained from plants found in bloom at Cape Borinquen, the northwestern point of the island, and at Cape San Juan, the northeastern. Near Cape Borinquen, on an elevated plateau of wide extent, the endemic Porto Rico Hat Palm or Palma de Sombrero (*Sabal causiarum*), growing in almost countless numbers, nearly to the exclusion of other trees, forms a very impressive unique feature, their massive trunks rising as columns, their leaves much used for the manufacture of hats, brooms, and baskets. At Cape San Juan the relatively dry climate permits rather abundant growth of the little prickly-pear cactus, *Opuntia repens,* called "Suckers" in the Virgin Islands and "Olaga" in Porto Rico, a plant breaking readily into joints, which become attached to clothing in a bothersome way and to the fur of animals; this is an unrecorded locality for the species, hitherto known to us in Porto Rico only in the southwestern coastal districts. Visits to the mountains provided subjects for other paintings; one of the most interesting is a shrub of the Thistle Family, *Proustia Krugiana,* endemic in Porto Rico, with very abundant, small yellow flowers in January and February, so fragrant as to strongly scent the air near the summit level of the Military Road between Coamo and Aibonito, betraying its proximity.

Chief Forester W. P. Kramer accompanied us on several occasions, for dendrological studies, and we collected additional samples of woods and accompanying herbarium specimens, for addition to the very large series formed by Professor Record at Yale University, supplementing material previously transmitted to him. An unexpected occurrence of Cobana Negra (*Stahlia mono-*

sperma), one of the endemic trees of Porto Rico, was detected by Mr. Kramer as a solitary tree in an arroyo near Coamo Springs; highly valued for its hard, heavy, nearly black wood, this tree has become scarce; we previously knew only two colonies, one on the eastern coast near Ceiba, the other near the western coast in the vicinity of Boqueron. This species has already been portrayed in "Addisonia" from a painting by Mrs. Horne. Altogether, specimens of two hundred and thirty different species of plants were collected and preserved, including rarities, species of economic or ornamental significance or otherwise interesting.

Mr. Robert Hagelstein, of Brooklyn, New York, expert in the study of diatoms, occupied with the investigation of these microscopic plants for the Scientific Survey of Porto Rico and the Virgin Islands, made a second collecting trip during our visit, paying continued attention to the species inhabiting fresh water, and gave us much interesting information regarding their local distribution; waters of the four thermal springs of the island were under his especial observation.

Mr. R. O. Williams, Superintendent and Assistant Botanist of the St. Clair Agricultural Experiment Station, Trinidad, British West Indies, visited Porto Rico in the latter part of February, especially engaged in a study of the grape-fruit industry. We found opportunity to discuss with him many botanical and horticultural topics of mutual interest, his "Flora of Trinidad and Tobago" now in course of publication, including many species native also in Porto Rico; his broad knowledge of exotics is a mine of information about tropical horticulture.

We continued studies of the many plants experimentally introduced into Porto Rico as economic species and as ornamentals, at the Agricultural Experiment Stations at Mayagüez and at Rio Piedras, at the Forest Service grounds, Rio Piedras, and at the Trujillo Plant Propagation Station. These four agencies, supplemented by plantings on several estates have, collectively, brought more kinds of exotic plants into Porto Rico than have been introduced on any other West Indian island. Records of most of these were included in the "Descriptive Flora of Porto Rico and the Virgin Islands" published in Volumes V and VI of the Scientific Survey (1922–1926). Many have been added during the past three years; these were taken note of, and the be-

havior of many of the earlier introductions was observed. This important experimentation was much interfered with at the Trujillo and Rio Piedras establishments by the destructive hurricane of September, 1928, but the collections at Mayagüez were less damaged; the very valuable collection of exotic trees at the Mayagüez Station, many having now reached large size, was studied in detail under the guidance of Mr. T. B. McClelland. Notes upon several hundred kinds of plants, wild and cultivated, have now been brought together to form a Supplement to the "Descriptive Flora."

Professor Herbert Osborn of the Ohio State University was in Porto Rico during our visit, prosecuting expert studies on the insect order Homoptera and I had the pleasure of his company on a collecting trip to Sabana Abajo, an extensive area of white sand, which supports characteristic vegetation, and where he obtained specimens of some interesting species of this order.

Geological studies were made at several points in the older rocks, in search of additional fossils for the use of palaeontologists of the Scientific Survey, and collections were secured from the hard limestones between Aibonito and Coamo, and at La Muda.

We gratefully appreciate information, aid, or hospitality from His Excellency, Governor Horace M. Towner and Mrs. Towner; from Professor Charles E. Horne of the University of Porto Rico, and Mrs. Horne; from Mr. John L. Gay, District Attorney of Porto Rico, and Mrs. Gay; from Hon. Carlos E. Chardon, Commissioner of Agriculture and Labor, and Señora Chardon; from Mr. D. W. May, Director of the Agricultural Experiment Station at Mayagüez, and Mrs. May; from Hon. Jaime Baguéy, Assistant Commissioner of Agriculture, and Señora Baguéy; from Mr. Otis W. Barrett, Director of Agriculture, and Mrs. Barrett; from Mr. T. B. McClelland, Horticulturist of the Mayagüez Experiment Station, and his mother, Mrs. McClelland; from Professor H. T. Cowles of the College of Agriculture and Mechanic Arts, and Mrs. Cowles; from Don Andrés Oliver Rosas of Arecibo, and Señora Oliver; from Mr. David Noble, Mr. Arturo Noble and the Misses Noble of Condado; from Mr. Harold I. Sewall of Naguabo, and Mrs. Sewall; from Mr. Charles W. Fowler of Humacao, and Mrs. Fowler; from Dr. Mel

T. Cook, Pathologist of the Rio Piedras Experiment Station, and Mrs. Cook; from Don Manuel Rabell of San Sebastian, and his mother, Señora Rabell; from Don Pedro Osuna and Don Francisco Sein of the Rio Piedras Experiment Station; from Mr. William P. Kramer, Chief Forester, and Mr. C. L. Bates, Assistant Forester; from Mr. W. V. Tower of Pueblo Viejo, and Mrs. Tower; from Mr. A. C. Toll of Candelaria, and Mrs. Toll; from Miss Clara Livingston of Sardinera; from Don Ramón Gandía Córdova of Santurce; from Mr. A. F. Kopf of Vega Alta, and Mrs. Kopf; from Mr. E. M. Elsworth of Cidra, and Mrs. Elsworth; from Mr. C. H. Crisson of Miramar, and Mrs. Crisson; from Dr. T. J. Ramirez of Mayagüez, and Mrs. Ramirez; from Don Miguel Colón of Coamo Springs, and Señora Colón; from Adolf Mayoral of the Trujillo Plant Propagation Station.

Respectfully submitted,

N. L. Britton,
Director-in-Chief.

FUNGOUS DISEASES AND INSECTS IN THE ROSE GARDEN

Introduction

There are now several thousand plants in the Rose Garden of The New York Botanical Garden, representing some 400 varieties, distributed among the various rose types. This means that a certain amount of attention must be given to the disease problems if the roses are to produce their full complement of blooms. In addition to the usual troubles due to aphids and other insects, one should expect that certain varieties must be especially protected against mildew, brown canker, black spot, etc. An account of our activities along these lines and the results obtained during the summer of 1928 are included in this report.

The control of aphids and leaf-eating insects presents no special problem. Well known practical methods only need efficient application to effect results. In case of the fungous diseases, the question as to the best method of keeping the plants healthy without marring the foliage with unsightly spray residues, such as occurs when they are treated with Bordeaux mixture or sulphur, is one which requires further investigation and experimen-

tation. Brown canker is coming to be known as one of the most destructive diseases in our rose gardens. In the absence of any method of treatment especially devised to combat this disease, it is conceded that the drastic cutting out of cankered canes and affected buds, followed by applications of fungicides, would result in a measure of control. Just how far such treatment could be effectively carried out in conjunction with the work on control of other diseases would be of interest to rose-growers, and it is a point particularly kept in mind in our campaign against black spot and mildew.

Equipment

For certain preliminary experiments on spray injury the ordinary atomizer and a small brass hand-spray outfit of about one quart capacity were very useful. If one has only a few rose bushes, the quart outfit would serve for the regular work of spraying. A four gallon auto-spray outfit with which a pressure of from 50 to 100 lbs. could be obtained was adequate for special treatment of certain beds. Similar outfits of two gallons capacity would have been satisfactory. In case one has a large rose-garden, a barrel sprayer of 25- to 50-gallon capacity mounted on wheels would be about the smallest size one would find practical. For our work, there was available an excellent power sprayer of 250 gallons capacity, giving a pressure up to 400 pounds. This sprayer was equipped with an assortment of nozzles, discs, rods, and spray guns. The mere matter of having on hand different types of nozzles and discs enables one to select an angled nozzle with a disc with a very small opening for spraying the low hybrid-tea roses. Such a choice not only saves spray material but assures more efficient application. For large climbing roses, a different type of nozzle or disc might be more efficient.

The dusting machine used was hand-operated, being provided with a fan blower, and holding about 5 pounds of sulphur. This duster was adequate for dusting even the largest roses in the garden.

Precautions

Since aphids and leaf-hoppers work on the under side of leaves, and certain fungi gain entrance to a leaf through the under side, the necessity for thoroughly covering both sides with the spray mixture or dust is apparent. When one is spraying with a pres-

sure of 300 lbs. the force of the mist may be strong enough to blow the leaves aside so that they will be completely covered. With less powerful hand outfits, one can, by using an extension rod and angle nozzle, direct the spray from below. Hybrid-tea roses are usually cut back so low that the leaves are only a few inches from the ground. Dashing raindrops strike the soil contaminated with fungus spores and rebound, carrying infection along with particles of soil to both sides of the leaves.

One is advised to avoid spraying when the dew is on or during the hottest part of a bright summer day. A good job of dusting can not be done when there is a strong wind. The desirability of always keeping the young foliage protected has led to the practice in some localities of dusting before rather than after a rain.

The use of laundry soap or fish-oil soap as a spreader is often recommended. When nicotine sulphate, one or two teaspoonfuls to the gallon of water, is used against rose aphids, one should add one ounce or about a cubic inch of soap to each gallon of water. Four or five pounds of whale-oil soap to a 100 gallons of water would increase the effectiveness of Black Leaf 40. Since hard soaps dissolve very slowly in cold water, the necessity for first dissolving the soap in a small quantity of boiling water is apparent. This of course is very inconvenient at times, but if the soap is used at all it should be first thoroughly dissolved.

Insects

In 1928, rose aphids began to appear in numbers about June 1. Ordinarily they are expected a little earlier or about the third week in May. The roses had not received a dormant spray of lime sulphur and there must have been a large supply of eggs for the first hatch. All of the roses were sprayed June 4, with 40 per cent. nicotine sulphate (Black Leaf 40), ¾ pint to 100 gallons of water, to which had been added 4 lbs. of whale-oil soap dissolved in boiling water. The results were very satisfactory and a second application at this time was unnecessary.

Later on in the autumn, the tip ends of the climbing roses particularly, and the flower-stalks of the hybrid teas again became rather badly infested. Weather conditions were such as to indicate that hybrid teas might be expected to bloom for some time if the aphids were not allowed to multiply further. On October

4 they were sprayed the second time for the year with the same strength of the nicotine sulphate mixture as before. Very few aphids survived this treatment.

No particular damage was done by rose beetles or other leaf-eating insects. The few bushes here and there harboring caterpillars were given individual treatment with arsenate of lead at the rate of three teaspoonfuls to one gallon of water. Two or three pounds to a hundred gallons is the usual proportion recommended for large quantities. Solitary zebra caterpillars, *Mamestra picta,* feeding on the roses, were not uncommon in September and October. They were destroyed by hand picking.

The rose stem girdler, *Agrilus viridis* L., was found in some canes of *Rosa Hugonis.* The larvae of these beetles work in the

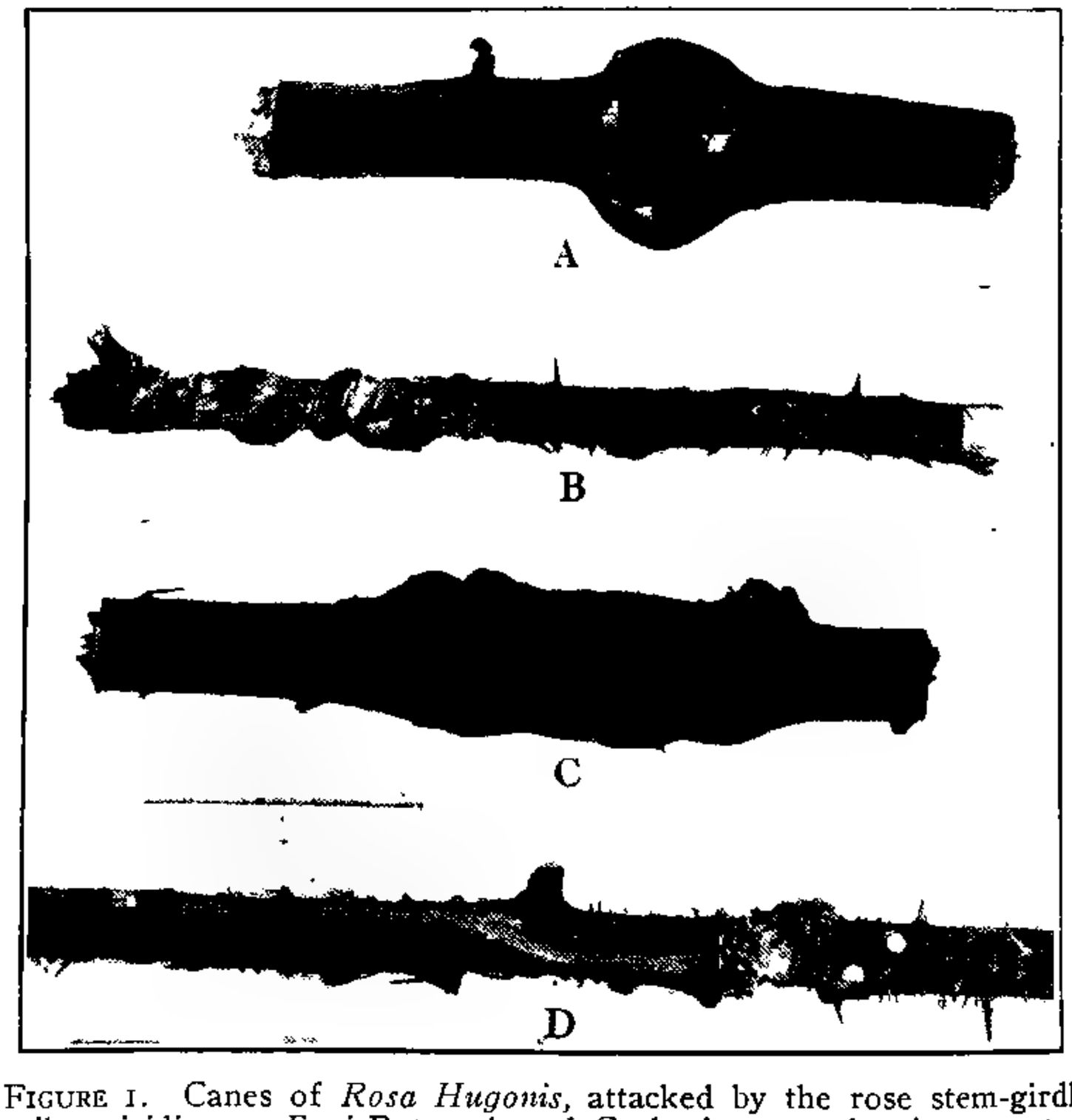

FIGURE 1. Canes of *Rosa Hugonis,* attacked by the rose stem-girdler, *Agrilus viridis* var. *Fagi* Ratz. A and C, dead canes, showing two types of galls, cut to show path of larvae. B and D, canes still alive; cut to show path of grubs working near the surface; the one in B working from left to right; the one in D working from right to left.

sap wood of this variety particularly, and usually follow around the stem in a close spiral (FIGURE 1). Should the burrow be rather large and come well out to the bark, the stem may break off at that point as though cut by a stem pruner. The borer may work straight down the stem for several inches (FIGURE 1, D). In this case the stem may not be very much swollen. Specimens examined in September showed the larvae still very active. The swellings from one half inch to three inches long are very characteristic. It is recommended to cut out and burn such parts of the stem.

FUNGOUS DISEASES

Black spot, mildew, and brown canker are the most destructive diseases of roses in this locality. The common stem-canker caused by *Coniothyrium Fuckelii* is also rather abundant, especially on the hybrid perpetuals.

It is generally conceded that regular and thorough applications of properly prepared Bordeaux mixture or a 300-mesh sulphur at about one-week intervals will keep down mildew and black spot on most varieties of roses, but, as noted above, these remedies are not satisfactory from the aesthetic standpoint. Other remedies recommended involve too great an expense. On this account it was decided to use a commercial preparation consisting mainly of ammoniacal copper-carbonate and nickel carbonate. This product contains its own spreader and leaves no noticeable residue on the foliage after it has dried. Preliminary trials proved that no spray injury to the foliage occurred when this material was applied at the strength recommended.

Beginning June 11, twenty applications were given the roses, as nearly as possible at five day intervals. At one time the spraying could not be done until the seventh day. The last spray was put on, September 13. On account of the number of rainy days between July 20 and 28, an extra application was added in that period.

Except as noted later, in connection with dusting experiments, all of the hybrid teas, hybrid perpetuals, polyanthas, and low-growing types were regularly treated. Only climbing roses were grown in another section of the Rose Garden. These varieties, said not to be particularly susceptible to black spot, were sprayed only occasionally or when sufficient spray mixture was left over after spraying the bush roses.

Mildew

As previously stated, most of the climbing roses were not included in the plots receiving regular treatment. Such varieties as Flame, Excelsa and Pink Dorothy Perkins are very susceptible to mildew. It was interesting to see on June 23 that only those plants that had received no treatment whatever were showing mildew. These particular plants were sprayed three times between June 25 and 30 and occasionally only thereafter. All mildew disappeared and none was seen throughout the summer until October or some three weeks after all spraying operations had ceased.

Some ramblers climbing over rocks outside of the regular plots were also discovered to be covered with mildew on June 28. It required considerable effort to bring the mildew under control by dusting with sulphur. This would indicate that they should have been treated much sooner, probably about June 1, if mildew on such susceptible varieties is to be prevented. It seemed remarkable that not a single variety of those roses regularly sprayed with the ammoniacal copper-carbonate preparation showed any mildew during the summer.

Weather Conditions

The general impression among growers in the vicinity of New York seemed to be that the summer of 1928 was a very wet one, and particularly favorable for fungous diseases. Weather Bureau reports show an excess of nearly three inches for June, and over three inches excess for July. Otherwise, considering the humidity, hours of sunshine or cloudiness, the summer was not particularly abnormal. Just what conditions give rise to epidemics of black spot are not known. During a period of three months through which these operations were carreid on, one application of spray mixture followed another only once without an intervening rain. In July there were only three 3-day periods without some rain.

The five sprays given the roses in June all happened to follow a rain within 24 hours, which would be according to directions, namely, spray after a rain. The length of time required for the germination of the spores and infection by the black-spot fungus has not been determined very definitely.

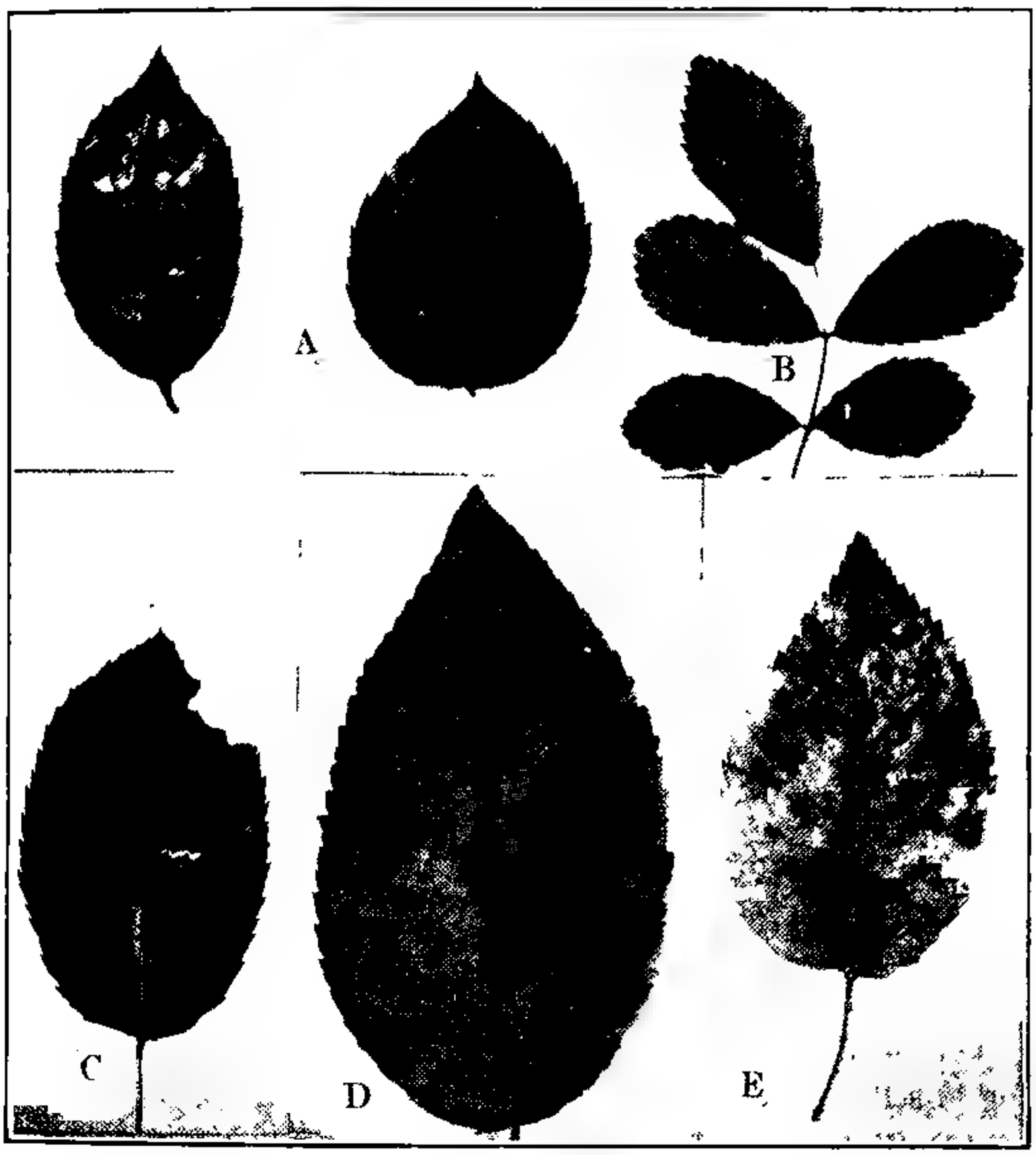

FIGURE 2. Leaf spots of roses. A, purple brown spots with light gray centers caused by aphids whose dead bodies were still attached beneath the spots, one to each spot, white spots due to insects. B, small purple spots with gray centers caused by the brown canker fungus, *Diaporthe umbrina*. C, grayish leaf spot caused by the fungus *Hainesia Lythri*. D and E, two types of black spot caused by *Diplocarpon Rosae*.

Four of the July sprays were followed by rain soon after the men were through spraying. On the theory that spores are distributed during rains and that the leaves should be protected during that interval, the July sprays must have been well timed. Just how long such a soluble spray would remain effective in the event of a rain is again not known. Rainy periods would not only contribute against efficient application of fungicides but would favor

rapid development and wide dissemination of fungous spores. I rained five days in succession, beginning July 10. During thi time there were only 18.7 hours of sunshine out of a possible 70 From August 22 to August 27, measurable rain fell every day anc there were only 18.1 hours of sunshine out of a possible 78 Foggy weather or such rainy periods no doubt favor black spot much more than the occasional downpour of several inches of rain.

In order to test out the relative merits of the ammoniacal copper-carbonate solution and a 300-mesh sulphur which had been dyed green, a number of beds of hybrid tea roses were dusted with the green sulphur at 5-day intervals. It was not deemed desirable to keep untreated plants as checks in this particular garden. Two experiments to be noted later bring out the fact that black spot quickly developed on certain varieties when treatment was discontinued.

All of the plants treated were inspected at least four different times and records were kept as to the relative amount of black spot. Actual count of infected leaves was made only when infection was slight. The last complete inspection was made between October 10 and October 15.

The first black spot seen, appeared July 10 on the varieties Henry Ford, Rose Marie, and Mrs. Charles Russell. The first named is very susceptible to black spot but the other two turned out to be fairly resistant.

The following varieties among those regularly treated according to schedule had shown no black spot during the summer and up to October 15. The number of individual plants of a given variety observed is usually stated unless the number grown was fewer than ten.

A. *Hybrid teas (except as noted)*

Aladdin		Earl Haig	
Antoine Rivoire		Ellen Willmott	45
Bertram J. Walker	4	Ethel Somerset	30
Bessie Chaplin		Etoile de France	
Betty		Francis Scott Key	22
Betty Uprichard		Gen. Sup. Arnold Janssen	30
Cleveland	82	George C. Waud	
Clotilde Soupert	10	Gladys Holland	40
Duchess of Wellington		Grace Molyneux	8

Hawlmark Crimson	45	Mme. Colette Martinet	85
Hon. Ira Bingham	4	Mme. Segond Weber	
Innocence	21	Mme. Jules Gouchault	
Jonkheer J. L. Mock	27	Mrs. Amelia Guide	38
Kaiserin Auguste Viktoria	75	Mrs. George Thomas	
Killarney	9	Mrs. Herbert Stevens, T.	5
Killarney Pink	28	Mrs. W. Christie-Miller	40
Killarney Queen	97	Ophelia	24
Königin Carola	8	Premier	32
Lady Ashtown	31	Red Radiance	55
La France	54	Reine Marguérite d' Italie	9
Lieutenant Chauré	22	Richard E. West	21
Maman Cochet, T.	15	Rödhätte	4
Marquise de Ganay	38	Rose Marie	62
Miss Cynthia Forde		Souv. de Georges Pernet	23
Mme. Abel Chatenay	44	Shot Silk	
Mme. Butterfly	50	Wellesley	
Mme. Caroline Testout	44	White Killarney	20

B. *Hybrid perpetuals*

Alfred K. Williams		Jules Margottin	
Barbarossa	4	Magna Charta	
Baron de Bonstetten		Margaret Dickson	
Candeur Lyonnaise		Mrs. John Laing	
Earl of Dufferin		Mrs. R. C. Sharman-Crawford	
Fisher Holmes		Oscar Cordel	
Frau Karl Druschki	75	Paul Neyron	
George Arends		Prince Camille de Rohan	
George Dickson		Roger Lambelin	
J. B. Clark		Suzanne-Marie Rodocanachi	
John Keynes		Ulrich Brunner	
Jubilee			

C. *Polyanthas*

Baby Dorothy		Lady Reading	28
Baby Tausendschön		La Rosée	5
Caroline Marniesse		Maman Turbat	4
Cecil Brunner		Maman Norbert Levavasseur	11
Chatillon Rose		Maréchal Foch	19
Echo	9	Marie Jeanne	
Edith Cavell	20	Marie Pavic	12
Ellen Poulsen	8	Martha Kellar	
Erna Teschendorff		Mrs. Wm. Cutbush	49
George Elger		Orange King	10
Ghislaine de Feligonde		Orléans	6
Greta Kluis	17	Paquerette	5
Gruss an Aachen	10	Triomphe Orléanais	14
Katharina Zeimet		Yvonne Rabier	8
Kitty	12		

D. *Hybrid Rugosas*

Agnes
Atropurpurea
Blanc Double de Coubert
F. J. Grootendorst
Mme. Georges Bruant
Mme. Julien Potin
New Century
Pink Grootendorst
Rev. E. M. Miller
Rugosa rubroplena
Sarah Van Fleet
Schneezwerg
Sir Thomas Lipton

E. *Hybrid Multifloras*

Amethyste
Birdie Blye
Electra
Ida Klemm
Lady Curzon, Gal.
Le Rigide
Minnie Dawson
Newport Fairy
Purple East
Wartburg

F. *Hybrid Wichuraianas*

Albertine
Alexandre Girault
American Pillar
André Louis
Aunt Harriet
Aviateur Blériot
Ben Stad
Casimir Moullé
Christian Curle
Christine Wright
Coronation
Dorothy Perkins
Dr. Henri Neuprez
Dr. Huey
Dr. W. Van Fleet
Emile Fortépaule
Emily Gray
Eugène Jacquet
Evangeline
Excelsa
Fernand Tanné
Flame
Freedom
Freifrau von Marschall
Gardenia
Gerbe Rose
Gertrude Rochfort
Gruss an Freundorf
Hiawatha
Huguette Despiney
Jean Girin
Joseph Liger
Klondyke
Lady Gay
Leontine Gervais
Mary Lovett
Maxime Corbon
Milky Way
Miss Helyett
Mme. Auguste Nonin
Mme. Victor Lottin
Miss Flora Mitten
Non Plus Ultra
Papa Rouillard
Paradise
Paul Transon
Petit Louis
René André
Renée Danielle
Romeo
Sea Gull
Shalimar
Shower of Gold
Silver Moon
Snowdrift
Sodenia
Source d'Or
Souv. de Ernest Thébault
Souv. de l'Aviateur Montalent
Souv. de l'Aviateur Metivier
Yvonne
White Dorothy

G. *Miscellaneous Climbing Roses*

Andenken an Gartendirektor Siebert, Lam.
Auguste Roussel, H. Mac.
Bloomfield Culmination, Cl. HT.
Bloomfield Dainty, Cl. HT.
Bloomfield Discovery, Cl. HT.
Bloomfield Fascination, Cl. HT.
Bloomfield Mystery, Cl. HT.
Bloomfield Rocket, Cl. HT.
Clarabel Nigler, Cl.
Climbing Helena, Cl.
Carmine Pillar, Cl. HT.
Climbing Richmond, Cl. HT.
Daybreak, H. Nois.
Elisa Robichon, Cl.
Frau von Brauer, Cl.
Grace Thompson, Cl.
Longworth Rambler, Cl. HT.
Prairie Queen
Starlight
Trier, Cl.
Von Scharnhorst, Cl. Per.

H. *Miscellaneous Roses*

Commandant Beaurepaire, Dam.
Comtesse du Cayla, C.
Fabvier, C.
Harrison's Yellow, A. B.
Jeannie Deans, H. Sb.
Lord Penzance, H. Sb.
Mme. Plantier, H. Nois.
Rosa Hugonis, C.
Xanthina Allard, Korean.
Zephirine Drouhin, Bour.

The fact that any one rose is included among the 222 varieties listed above is not necessarily to be taken that it can easily be kept free from black spot wherever it may be grown; neither may it be assumed that it is so resistant as to need no protection. In some cases only a small number of plants were available. Some of the varieties were not grown under very favorable conditions. The Red Radiance, Premier, and Rose Marie are included here, although a few diseased leaves were found on plants in other beds. Probably no variety is really immune to black spot. Most hybrid Rugosas and climbers are rather resistant and would need no protection. These types are listed because a few of their varieties have proved to be susceptible and would need treatment if it was desired to keep them in good foliage through the season.

The following list includes those varieties which at any time during the summer up to October 15 showed black spot on even a single leaf, but not enough to be really of any consequence. That is, good commercial control was obtained by the treatment given them. Where the number of individual plants is not given there were probably fewer than ten.

A. *Hybrid teas (except as noted)*

Aspirant Marcel Rouyer	11	Lady Ursula	20
Bloomfield Abundance	12	La Tosca	60
Charles K. Douglas	80	Marie van Houtte, T.	50
Chateau de Clos Vougeot	44	Martha Drew	108
Colonel Leclerk	32	Miss C. E. van Rossem	56
Columbia	15	Mme. Abel Chatenay	43
Constance, Per.	44	Mme. Edouard Herriot	170
Diana	4	Mme. Léon Pain	62
Dorothy Page-Roberts	45	Mme. Marcel Delanney	5
Ecarlate	50	Mme. Meha Sabatier	12
Edel	24	Modesty	30
Etoile de Hollande	5	Mrs. Aaron Ward	44
Florence Forestier	5	Mrs. Charles Bell	43
General MacArthur	38	Mrs. Charles E. Russell	98
Gen. Sup. Arnold Janssen	47	Mrs. Henry Morse	10
George C. Waud	44	Mrs. William C. Egan	7
Golden Ophelia	113	Ophelia	71
Gruss an Teplitz	12	Premier	118
Harry Kirk, T.	79	Radiance	103
Hoosier Beauty	44	Red Radiance	183
Hortulanus Budde	38	Red Star	6
H. V. Machin	63	Rev. F. Page-Roberts	129
Indiana	18	Richmond	75
Irish Elegance	5	Robert Huey	18
Isobel	2	Rose Marie	43
Jacques Porcher	38	Secretaris Zwart	6
Königen Carola	35	Souv. de Claudius Pernet	50
Lady Alice Stanley	20	Souv. de H. A. Verschuren	75
Lady Pirrie	30	Willowmere	46

B. *Hybrid perpetuals*

Alfred Colomb		Duchess of Sutherland	6
Anna de Diesbach		George Dickson	
Baron Rothschild		Gloire de Chédane-Guinoisseau	
Baroness Rothschild		Gloire Lyonnaise	
Baron von Pfloeg		Heinrich Münch	
Captain Christy		Hugh Dickson	
Captain Hayward		John Hopper	
Clio		Jules Margottin	
Eugene Furst		Merveille de Lyon	
Frau Karl Druschki	80	Mme. Gabriel Luizet	
Gen. Jacqueminot			

C. *Hybrid Wichuraianas*

Adélaide Moullé
Alida Lovett
Bess Lovett
Bloomfield Courage
Climbing American Beauty
Coralie
Dr. W. Van Fleet
Dorothy Dennison
Gen. John Pershing
Paul's Scarlet Climber
Silver Moon
Vicomtesse de Chabannes
Victory

D. *Miscellaneous varieties*

Bloomfield Decoration, Cl. HT.
Bloomfield Discovery, Cl. HT.
Elizabeth Negler, Cl.
Empress of China, Cl.
Lady Penzance, H. Sb.
La Garlande, Cl.
Maharajah, H. Sb.

Several varieties included in this list showed only a very few diseased leaves during the summer. In some instances not a single spot could be found on September 13 when the treatments were discontinued. It may therefore be assumed that such varieties are not highly susceptible and that ordinary precautions would keep them fairly free from black spot. The varieties Charles K. Douglas, La Tosca, and Frau Karl Druschki at times did show more spotting on certain plants than would perhaps justify putting these varieties in a list of those which are not very susceptible to black spot. During September and October they seemed to be in excellent foliage though no protection had been given them since September 13.

The 103 Radiance plants that had been dusted with sulphur showed no black spot at all until October 15, a full month after the last application of sulphur. Plants of this variety in Prof. R. A. Harper's garden at Ridgewood, New Jersey, were very badly infested in August. It is possible that a difference in locality might account for this difference in infection, but it is more likely to have been due to the efficacy of the sulphur dust on the one hand and the lack of any protection on the other.

One bed of Red Radiance containing 30 plants which were sprayed regularly, and another bed of 25 plants dusted with sulphur showed no black spot during the summer. This variety is certainly fairly resistant and would ordinarily need little protection.

One bed contained 60 new plants of the variety Frau Karl Druschki. They grew vigorously and under the treatment given

them remained free from black spot, yet certain older plants in the border where there was not very good air circulation and where they were not always thoroughly sprayed, developed a great deal of spot. This indicates that even with a fairly susceptible variety the disease can be kept down if proper care is taken.

Most of the climbing roses were sprayed only occasionally, that is, only when necessary to keep down mildew or when there happened to be enough spray mixture left over after covering the hybrid teas. If they had been given the regular treatment no doubt black spot would have been hard to find on them. As it was, the disease was of little consequence in most cases.

Susceptible varieties

In the third and following list are included those varieties which at some time seemed to be particularly susceptible and which, under the conditions here, would certainly require particular care if black spot was to be kept under control.

Varieties rather susceptible to black spot

A. *Hybrid teas (except as noted)*

Eldorado	40	Mme. Jules Grolez	
Felicity	6	Mme. Marcel Delanney	15
Flammenrose, Per.	43	Mrs. F. R. Pierson	43
Frau Dr. Erreth	100	Mrs. Henry Bowles	100
Grange Colombe	115	Mrs. S. K. Rindge, Per.	72
Gustav Grünerwald	9	Padre	12
Hadley	82	Serge Bassett	19
Henry Ford	128	Wilhelm Kordes	
Independence Day	18	Souv. de Claudius Pernet	
Los Angeles, Per.	77		

B. *Miscellaneous*

Amy Robsard, H. Sb.		Jessie, Poly.	25
Baronesse van Ittersum, HM.		Julia Mannering, H. Sb.	
Bess Lovett, HW.	10	Juliet, Per.	
Blush Rambler, HM.		Lucy Bertham, H. Sb.	
Brenda, H. Sb.		Mary Wallace, HW.	
Climbing Orleans, Cl. Poly.		Mme. Jules Grosvenor, HP.	
Conrad F. Meyer, H. R.	4	Nova Zembla, HR.	
Débutante, HW.		Paul's Scarlet Climber, HW.	
Evergreen Gem, HW.	8	Purity, HW.	
Flora McIvor, H. Sb.		Purple East, HM.	
Gruss an Freundorf, HW.		Rose Bradwardine, H. Sb.	
Green Mantle, H. Sb.		Star of Persia, H. Foet.	

Black spot which first appeared on the Henry Ford variety July 10 had increased to such an extent by July 26, in spite of the three extra applications of spray mixture put on between these dates, that all plants of this variety were dusted with sulphur on July 26 and July 31. Thereafter they were sprayed according to the regular schedule. No further spotting occurred during August and September. On October 5, or about three weeks after spraying operations were abandoned, black spot began to spread rapidly again, so that by October 19 every plant was practically defoliated. This would seem to indicate the advisability of continuing the protection at least two weeks longer or well through September in case of such susceptible varieties.

A Pernetiana variety, Mrs. S. K. Rindge, of which there were 72 plants in the bed, proved perhaps the most susceptible variety in the Rose Garden. In spite of three additional applications of the spray mixture many leaves were lost. There is no question that the treatments saved much foliage, however. By September 13, the date of the final application, the plants had a fairly good covering of new uninfected leaves. About October 1 most of these leaves became infected. As it requires from 10 days to two weeks for the spots to show after infection it is clear the spray mixture does not remain effective very long.

The variety Wilhelm Kordes is said by some to be resistant. Our plants showed not a little black spot during the summer in spite of the protection given them. Defoliation was not at all marked.

There were 115 plants of the variety Grange Colombe in one bed. A few spots only had developed on three plants by August 23; as this was taken to indicate a high degree of resistance, no further notice was given this variety for some time. On October 9 leaves on practically every plant showed flecking, which within a few days grew to be big spots. This showed again the necessity for continuing protection up to within about two weeks of expected killing frosts, if it is desired to keep the foliage in good condition during the late fall-blooming period.

Most Polyanthas appeared to be rather resistant to black spot. The variety Jessie grown in three different beds developed a peculiar lacy type of spot. The affected leaves usually remained on the plant for a long time.

Three large plants of the Hybrid Rugosa variety Conrad F. Meyer grew in such a position in the border that only one side of the plants was sprayed regularly. The difference in the amount of spot which developed on the treated and untreated leaves was very striking.

A number of varieties of Hybrid Multifloras, Sweetbriers, and Wichuraianas are included among those listed as very susceptible because they did show in October much black spot. No doubt regular treatment with the spray mixture would have kept them in very good condition to the end of the season.

The good results following supplemental treatment with sulphur are suggested in connection with the variety Frau Dr. Erreth. No black spot was seen on any of the 80 plants in this bed until August 23. The disease spread very rapidly until every plant showed spotting. They were then all thoroughly dusted twice within a week. Though all of the originally infected leaves fell off, the sulphur in addition to the regular five-day spray, prevented further infection, and by October 9 no spot was visible. That no black spot again appeared is perhaps in part due to the fact that the bed was again dusted September 15 merely to demonstrate the fan duster used. The sulphur had prolonged the period of protection beyond what could have been expected of a highly soluble spray mixture. On the whole, however, the ammoniacal copper-carbonate mixture certainly proved much more effective than was expected in controlling black spot in the months during which so many rains were recorded. This conclusion is further justified by the amount of black spot seen on similar varieties in other rose gardens in the vicinity where the plants had not been protected against the disease. On the other hand, certain experiments carried on in which only sulphur was used or where the use of the spray mixture was abandoned and dusting sulphur substituted, suggest that the 300-mesh sulphur, dyed green, will also bring susceptible varieties through the season free from disease and in more vigorous condition.

Roses dusted with sulphur

The following varieties occupied the two rows of beds which were regularly dusted with the 300-mesh sulphur, dyed green:

Radiance	105	La Tosca	12
Red Radiance	25	Maman Turbat	4
Killarney Queen	50	Willowmere	9
Killarney	37	Mme. Edouard Herriot	50
La France	54	Ecarlate	14
Mme. Léon Pain	18	Gen. Sup. Arnold Janssen	27
Marie Pavic	8	Ophelia	52
Mme. Norbert Lavavasseur	10	Golden Ophelia	67
Gustav Grünerwald	9		

The dusting was usually done in the morning of the same day the other roses were sprayed, so that they were dusted about 20 times from June 11 to September 13. Plants of the varieties La Tosca, Mme. Léon Pain, Willowmere, and Mme. Edouard Herriot showed a few spots during August. Practically no new infections were found until October 9, nearly a month after the last application of dust. The other varieties showed practically no spot during the whole season. The plants in these two rows were conspicuous in the garden because of their better condition, more beautiful foliage, and greater abundance of blooms. That this was not altogether due to a more favorable location is evident by the change wrought in other beds by special applications of sulphur.

Golden Ophelia

There were in the garden two comparable beds of Golden Ophelia. One had been dusted with sulphur, the other sprayed with the ammoniacal copper-carbonate solution every five days since June 11. On August 8 the one treated with sulphur looked

Figure 3. Part of bed of Golden Ophelia roses, a variety fairly resistant to black spot. Left side dusted with sulphur August 8 to September 13; right side not treated between these dates. Photographed November 17. See text for further explanation.

to be in a much finer condition, although no black spot showed in either bed. Spraying the second bed was then discontinued. The east half of this bed, containing 25 plants, was regularly dusted with sulphur, the other half remained without any protection. The plants dusted gradually improved in appearance, while some black spot began to develop on the others. Many leaves turned yellow, even if slightly infected, and some fell off. During the month of October frequent counts showed that the protected plants had about twice as many blooms and very much heavier foliage. FIGURE 3 shows how the plants looked on November 17. The plants at the left still had an abundance of foliage, although the photograph was taken two months after the last application of sulphur was made.

MRS. HENRY BOWLES

Much defoliation due to black spot was occurring August 8 on plants of the variety Mrs. Henry Bowles in spite of the fact that they had been regularly sprayed every five days. Spraying of the one bed containing 107 plants was then discontinued. About three fourths of the plants were then regularly dusted with sulphur; the rest of the plants were not treated. By September 13 the untreated plants had lost practically all of their leaves. Due, however, to the continued protection given the plants in the other parts of the bed they held a great deal of foliage and gave about the finest showing of blooms to be seen in the garden in October. Black spot did finally attack these plants also, but not until nearly a month after the last application of sulphur was made. If the practice of growing only those varieties which are reasonably resistant to black spot were to be adopted, then this beautiful rose, Mrs. Henry Bowles, which can be fairly well protected with sulphur dust, would be abandoned.

LATE-FLOWERING ROSES

The following varieties of roses were giving a very fine showing of blooms October 25, 1928. Date of first frost, October 26.

Ethel Somerset	Fabvier
Ellen Willmott	La Tosca
Grange Colombe	Mrs. Aaron Ward
Martha Drew	Souv. de Claudius Pernet
Mme. Edouard Herriot	Souv. de Georges Pernet
Golden Ophelia	Diana

Mrs. Henry Bowles	Mrs. W. Christie-Miller
Mrs. Wm. Cutbush	Colonel Leclerk
Maman Turbat	Rose Marie
Radiance	Serge Basset
Red Radiance	Killarney Pink
Ecarlate	Mrs. Charles Bell
Gen. Sup. Arnold Janssen	Ophelia
Killarney Queen	Clotilde Soupert
Lady Reading	Lieutenant Chauré
Premier	Jacques Porcher
Souv. de H. A. Verschuren	Mme. Colette Martinet
Charles K. Douglas	Rödhätte
Gen. MacArthur	Edel
Lady Alice Stanley	Gruss an Teplitz
Hortulanus Budde	Flammenrose
Frau Dr. Erreth	Rev. F. Page Roberts
Cleveland	Mme. Abel Chatenay
Gladys Holland	Birdie Blye
Mme. Léon Pain	La France
Jessie	Chateau de. Clos Vougeot
Miss C. E. van Rossem	Lady Ashtown
Lady Pirrie	Constance

Brown Canker

As noted previously, brown canker was prevalent on old canes of many varieties in the spring of 1928. Canker canes were usually cut out when discovered, but the presence of the fungus was sometimes not noticed until the affected canes had died. No new cases of infection appeared on new canes during the summer. All of the varieties were carefully inspected several times with the view to learn when to expect new infections. The most susceptible types were among the varieties regularly sprayed with the ammoniacal copper-carbonate solution. Unless the fungus is one that does not develop much during hot weather it would appear that the fungicide used was very effective in the control of brown canker. During the first week in October, that is, about three weeks after the last application of the fungicide, several plants of the variety Mrs. S. K. Rindge began to show blighting of the tips of canes, which turned dark brown. The disease spread rapidly down the canes and fruit bodies of *Diaporthe umbrina* matured. By the 15th of November it was clear that this bed of 72 plants was doomed. When they were uncovered in

March it was found that not a single plant had survived. Othe varieties of roses in the garden showed some brown canker i March, but there seems to be very much less canker present the than there was a year ago. Just how much this difference is du to the fungicide used, of course is not certain.

B. O. DODGE.

A NEW WORK DESCRIBING THE GENERA OF FLOWERING PLANTS*

No attempt has been made, since the completion of the Dalla Torre & Harms "Genera Siphonogamarum" in. 1907, even to list all of the known genera of flowering plants. A book that undertakes not only to list them, but to supply a concise description of each, is consequently worthy of a warm reception and constant use as a work of reference.

The first volume of such a monumental undertaking made its appearance in March of this year. It is alphabetically arranged, and extends (even though a thick volume of more than 900 pages) only as far as the end of Ca; a second volume, to the end of E, is promised in March, 1930; and succeeding volumes annually thereafter, until the end of the alphabet is reached.

The descriptions are all in the French language, which is the native tongue of a pitifully small proportion of the botanists of to-day, and it is not unlikely that many of the genera have never before been published with French descriptions. Yet the author was wise to write his descriptions in his own language, and most botanists read French as readily as any language other than their own.

The citations are extremely crude, but usually sufficient. For instance, on page 105, three genera are described, two of them first published in the same journal. The two citations read: (1) "Engl. Jahrb. 1913. 406"; (2) "Bot. Jahrb. XVII. 111." The former citation is peculiarly unfortunate, because vols. 48 and 49 both bear the date 1913 on their title-pages, and a part of vol. 50 was issued in the same year!

* LEMÉE, ALBERT. Dictionnaire descriptif et synonymique des genres de plantes phanérogames. Tome 1. [A-Ca.] i-xxxi. 1–896. Brest, [Mr] 1929. (Address of the author: "M. A. Lemée, Le Trésorier Général, 2 rue de la République, Brest, Finistère, France.")

The author of this work, Albert-Marie-Victor Lemée, "Chevalier de la Légion d'honneur," and "trésorier général" of the department of Finistère, is an enthusiastic amateur botanist who deserves the gratitude and support of every taxonomic worker.

J. H. BARNHART.

CONFERENCE NOTES FOR MARCH

The monthly conference of the Scientific Staff and Registered Students for March was held on the afternoon of the 13th.

Dr. Fred J. Seaver gave a brief account of some work on the genus *Phyllachora* conducted in connection with his "Studies in Tropical Ascomycetes." Numerous species of this genus occur in the tropics on dicotyledonous hosts, whereas in the northern regions the species of this genus are more common on grasses and other Monocotyledons. Several new species were described by Dr. Seaver in a recent paper, among them *Phyllachora Pennelli* on the leaf of an unnamed tropical tree. This was later found to be identical with a species reported by Dr. P. Hennings of Europe from Costa Rica. A full account of this work with illustrations is being published in the July–August issue of *Mycologia.*

Mr. E. J. Schreiner reported on "The Imperfect Stage of *Cryptosphaeria* found on the Balm-of-Gilead Poplar." The somewhat technical report of studies with this fungus is of special interest to mycologists and plant pathologists and will hence be published in *Mycologia.*

A. B. STOUT,
Secretary of the Conference.

PUBLIC LECTURES DURING MAY AND JUNE

The program of the illustrated lectures at The New York Botanical Garden during May and June follows. They are given in the Museum Building on Saturday afternoons, beginning at 4:00 o'clock; doors are opened at 4:15 to admit late-comers.

May 4. "Tulips and Narcissi in Holland," Mr. John C. Wister, Secretary, Pennsylvania Horticultural Society.
May 11. "Wild Flower Preservation," Mr. P. L. Ricker, President of the Wild Flower Preservation Society.
May 18. "Landscaping your own Garden," Mrs. C. Albert Schwab, Federated Garden Clubs of New York.
May 25. "Azaleas and Rhododendrons," Mr. Henry Hicks, Nurseryman and Rhododendron Specialist.
June 1. "American Iris Breeders," Mrs. Wheeler H. Peckham, Honorary Curator, Iris and Narcissus Collections.
June 8. "Day Lilies," Dr. A. B. Stout, Director of the Laboratories.
June 15. "Flowers in the Perennial Border," Mr. Kenneth R. Boynton, Head Gardener.
June 22. "Roses," Dr. Marshall A. Howe, Assistant Director.
June 29. "Economic Fungi," Dr. Fred J. Seaver, Curator of Fungi.

NOTES, NEWS, AND COMENT

Mr. E. J. Schreiner and Mr. Maurice Condon are spending a month at Rumford, Maine, in the work with hybrid poplars and with planting them for forestation.

Dr. Marshall A. Howe, Assistant Director, attended meetings of the National Academy of Sciences and of the National Research Council held in Washington, D. C., April 20 to 24.

Dr. A. B. Stout, Director of Laboratories, spent about two weeks in May at the State Experiment Station, Geneva, N. Y., in coöperation with members of the staff in studies of the pollina-

tion requirements of the most important of the fruits grown in New York State. A bulletin reporting on these studies is now being prepared.

Mr. Yukio Yamada, who is soon to remove from Tokyo to accept a position in the Hokkaido University at Sapporo, spent two or three weeks at the Garden in March and April, engaged in the study of Japanese marine algae, mainly of his own collecting. The marine plants are put to a variety of uses in Japan, principally as articles of food. The seaweed crop in that country has a value of several millions of dollars a year.

At a meeting held at the offices of the Horticultural Society of New York on April 11, a new gladiolus society for New York was organized, and it was voted to hold the first annual exhibition of the society at the Museum Building of The New York Botanical Garden on September 7 and 8, 1929. At that time, the display plantings at the Garden are expected to be at the height of their bloom.

Officers of the society were elected as follows:

President: Dr. Forman T. McLean, New York Botanical Garden.

Vice-President: Mr. John Scheepers, 522 Fifth Avenue, New York City.

Secretary *pro-tem.*: Mr. Henry C. Wylie, 408 West 20th Street. New York City.

Treasurer: Mr. Charles A. Robinson, 597 Park Avenue, East Orange, New Jersey.

Sectional Vice-presidents:

Mr. Harry F. Page, Cranford, New Jersey.

Mr. Ladson Butler, Jackson Heights, Long Island, New York.

Mrs. Jos. Frogatt, East Orange, New Jersey.

Mrs. Jerome W. Coombs, Bronxville, New York.

Mr. Norman Lindop, Pearl River, New York.

Mr. Ernest W. Holling, Woodhaven, Long Island.

A second meeting was called for the evening of May 9, at the offices of the Horticultural Society, at which there was a short talk on gladiolus-growing, and plans for the coming show were discussed.

Meteorology for March. The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: 51° on the 4th; 74° on the 6th; *81° on the 22nd*; and 63° on the 26th. The minimum temperatures recorded were: 29° on the 1st; *11° on the 10th; 27°* on the 12th; 34° on the 21st; and 32½° on both the 27th and the 30th. The total precipitation for the month was 3.12 inches.

ACCESSIONS

Museums and Herbarium

2 specimens of fungi from New York. (By exchange with Dr. W. S. Thomas.)

1 specimen of *Micropora Abietis* from New York. (By exchange with Dr. C. R. Orton.)

1 specimen of *Nectria coccinea* from Wisconsin. (By exchange with Dr. D. V. Baxter.)

3 specimens of fungi from Maryland. (By exchange with Mr. A. F. Skutch.)

1 specimen of *Aleuria aurantia* from Washington. (By exchange with Professor T. H. Macbride.)

14 specimens of fungi from Indiana. (By exchange with Professor A. R. Bechtel.)

1 specimen of *Peziza fuscorubra* from Kansas. (By exchange with Dr. Elam Bartholomew.)

76 specimens "Mycotheca Carpatica," facicles 17–19. (Distributed by Dr. Franz Petrak.)

1 specimen of *Dothidella Laminariae* from Long Island. (By exchange with Mr. Roy Latham.)

8 specimens of *Sclerotinia Geranii* from New York City. (Collected by Dr. Fred J. Seaver.)

1 specimen of *Coccophacidium Pini* from Bridgeton, New Jersey. (Collected by Mr. Richard P. White.)

29 specimens of fungi from Illinois. (By exchange with the University of Illinois.)

2 specimens of fungi from Colombia. (By exchange with Mr. Rafael A. Toro.)

2 specimens of fungi from Pennsylvania. (By exchange with Dr. L. O. Overholts.)

24 specimens of fungi from Juan Fernandez Island. (Given by Dr. C. Skottsberg.)

1 specimen of *Hypoxylon papillatum* from Maine. (By exchange with Professor J. H. Miller.)

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Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of narcissi, daffodils, tulips, irises, peonies, roses, lilies, water-lilies, gladioli, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than one million specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 38,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural, and forestal subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————

All requests for further information should be sent to

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THE FULVOUS DAYLILIES—I

1. THE HEMEROCALLIS FULVA CLON EUROPA

The oldest and the best-known of the fulvous daylilies is the one commonly cultivated under the name *Hemerocallis fulva* L. This single-flowered daylily was described by Lobel in 1576 (Historia) as having cinnabar-red coloring in the flowers and as being in this particular very distinct from the yellow-flowered daylily (*H. flava*), which was also then in cultivation in Europe. In 1601, Clusius (Plantarum Historia) states that this plant was being grown in many gardens throughout Austria and Germany. Nearly two hundred years later, Linnaeus (1753) considered this daylily as a hybrid, but a few years afterward (Species Plantarum, ed. 2, 1762) he gave to it the specific rank and the name *Hemerocallis fulva* which have since been accorded to it.

But the plants of this particular daylily do not produce seeds to any kind of pollination possible for them alone. They are evidently never able to do so because of a complete self-incompatibility in the processes of fertilization. The propagation of this daylily is by division. All the plants of it are merely branches derived from one original seedling and hence they constitute a *clon* and not a species or a variety that reproduces true to type by seeds. This distinction was not recognized by Linnaeus, but it is necessary to make the distinction if one is clearly to understand the true status of those groups of plants, both in culture and in the wild, that have arisen from a single individual by repeated vegetative division. The *Hemerocallis fulva* of Linnaeus, which was in cultivation in Europe for at least one hundred and eighty-six years before his date of naming it as a species (1576 to 1762), and which has continued in cultivation for one hundred and

sixty five years since that date a total of over three and a half centuries—exists solely as a clon.

The question arises whether this clon, the *H. fulva* of Linnaeus, is represented among the wild daylilies and is itself typical of a natural species. Botanical and horticultural explorations and studies in Japan and China, beginning about the year 1700 and continuing to the present date, have revealed various fulvous daylilies, but the exact counterpart of the *H. fulva* of Linnaeus has not been discovered as a wild plant. Nor does there seem to be any conclusive evidence that it has been included among the daylilies recently in cultivation in the Orient. On certain of the fulvous daylilies found, there were bestowed such names as *H. fulva* var. *Kwanso, H. disticha* Donn, *H. disticha* var. *flore-pleno, H. longituba* Miq., *H. fulva* var. *longituba* Maxim., *H. fulva* var. *angustifolia* Baker, and *H. fulva* var. *maculata* Baroni. Thus the rather marked differences between the various fulvous daylilies found in the Orient and the *H. fulva* of Linnaeus were recognized. However, conservative botanical treatments, such as that of the Index Kewensis, have included all the various forms mentioned above in the one species, *H. fulva.* These rather diverse forms are to be recognized as valuable material for use in breeding, especially since the fulvous daylilies seem destined to play an important rôle in the development of new red-flowered daylilies valuable for garden culture.

It is time to review the different fulvous daylilies in respect to their identity and interrelationships. The knowledge now available regarding their natural distribution in the Orient is meagre and inadequate. An attempt may be made to recognize the types of them that are now known both as wild and as cultivated, and to comment on their botanical relationships and their horticultural status. In doing this the botanical status and the horticultural status of each should be clearly considered. Those that are merely clons should be recognized as such. Possibly this may lead to a better understanding of what the wild species are like.

The horticultural name "Europa Daylily" is here suggested for the single-flowered fulvous daylily which has been in continued cultivation in Europe at least since the first description of it by Lobel more than 350 years ago. This is historically the Linnaean type of the species *Hemerocallis fulva.* But this particular plant

is a clon and it is very doubtful if its exact counterpart exists among the wild plants of the Orient. The true botanical status of the clon is simply that of the one original seedling selected for the first propagation. This status is better expressed by using a clonal name botanically, such as *Hemerocallis fulva* clon Europa, or merely by using the horticultural name Europa Daylily, than by continuing to use *only* the species name bestowed by Linnaeus.

The Europa Daylily probably arose as a single somewhat aberrant seedling, either wild or in garden culture, which attracted the attention of some Oriental gardener. Possibly the fullness of the flowers and the somewhat bold pattern of their coloring were outstanding qualities. The plant happened to be completely self-

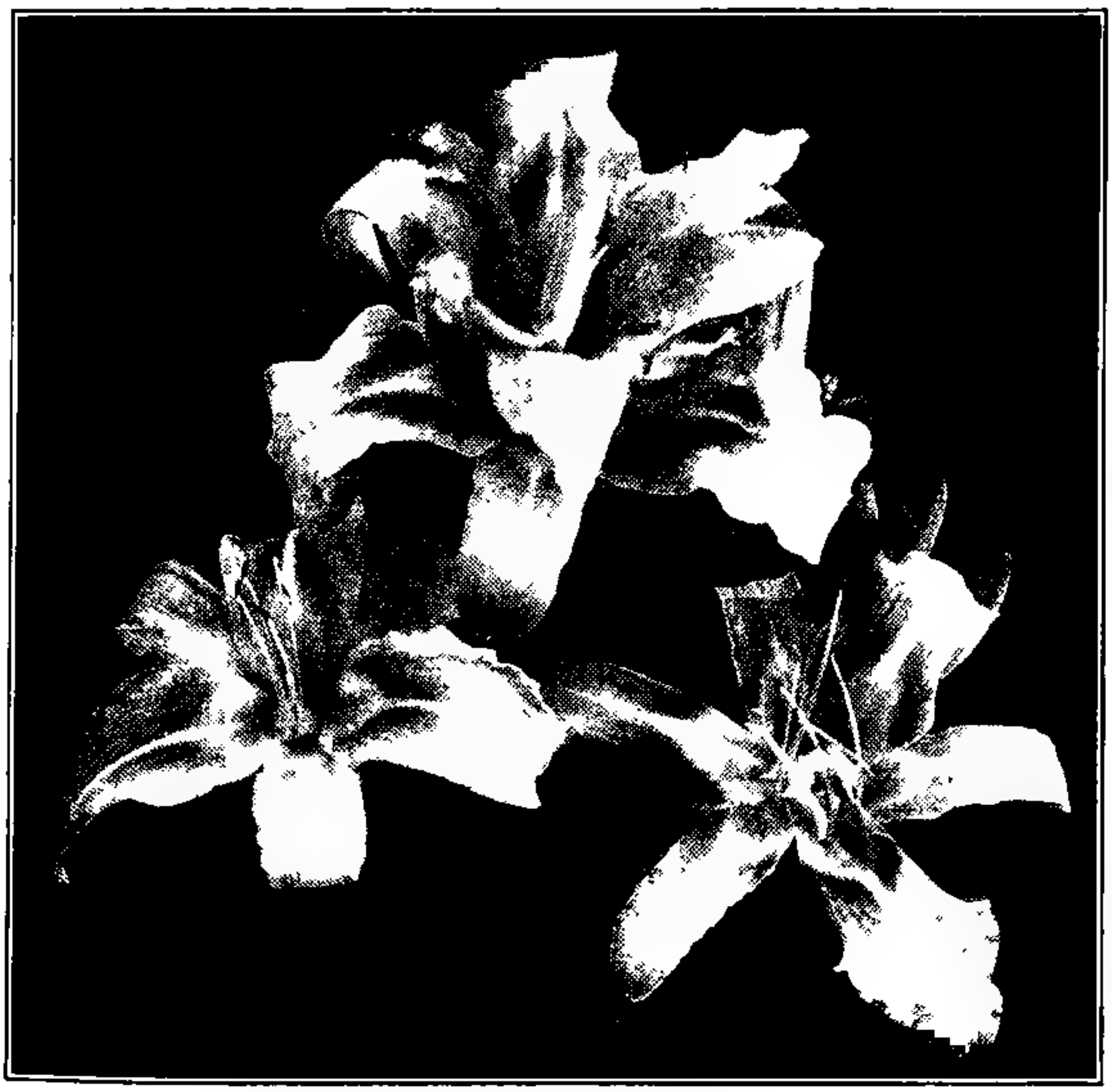

FIGURE 4. At lower left, simple flower of the Daylily Europa; at lower right, a semi-double flower from a plant chiefly bearing such flowers; above a very double flower. All are fulvous daylilies with almost identical coloring.

incompatible—a type of sterility very common in daylilies. But it also happened to have the habit of spreading vigorously by rhizomes and this made vegetative propagation easy and has maintained the individual character of the original seedling throughout several centuries of garden culture. This clon remains today in vigorous growth and is thus a demonstration that long-continued asexual reproduction does not of itself necessarily reduce vigor and lead to degeneration. We may perhaps assume that the Daylily Europa had its origin in the Orient, together with the Lemon Daylily (*H. flava*). How and when these two found their way into garden culture in Europe as reported in 1567 are at present apparently matters of conjecture.

A plant of the Europa Daylily is among the most robust of daylilies. In coarseness of foliage and vigor of growth it is surpassed only by the double-flowered form. The dome of leaves reaches a height of about three feet. The leaves are light green, strongly distichous in arrangement, and rather coarse. The plant extends itself vigorously by widely spreading rhizomes. The roots are numerous, and some are enlarged or fleshy. The strong scapes are stiffly erect to a height of about 50 inches, are branched at the summit, and bear as many as 15 to 20 flowers.

The flowers have a fulvous overcast of color in the outer zone of the open flower with reticulated veins of darker shades. An arching mid-zone of darker shade in the petals is a conspicuous feature. The throat of the flower is orange only. The petals are rather thin, slightly wavy along the margin, and of delicate texture, yet they retain form and color well during the day. The segments are rather broad and overlapping, giving a full flower.

The capsule, produced only rarely and to the compatible fertilizations of certain cross-pollinations, is about one inch in length, broadly ovate, with the apex truncate and indented.

The persistent self-unfruitfulness of the entire clon of the Europa Daylily makes it impossible to obtain selfed seedlings of the clon. Its sterilities in cross-relations are also so decided that it is only within very recent years that the clon Europa has been used successfully in hybridization with other daylilies.

2. The Double-flowered Fulvous Daylilies

The varietal names "*Kwanso*" and "*flore-pleno*" have been given to double-flowered daylilies that are very closely related to

the Daylily Europa. The first record of such a daylily is by Kaempfer, a physician and botanist who was among the first of the Europeans to live in Japan. In his volume on Japanese plants (Amoenitatum Exoticarum . . . Descriptiones, 872. 1712) he mentions an " Iris " and briefly describes it as having large double flowers of the color of fire. But he gave the Japanese names for it (Ken, Quanso, and Wasrigusa), through which the plant was identified later by Thunberg (Flora Japonica, 1784) as a *Hemerocallis.*

A Japanese work on plants (Somoku-Dzusetsu, 2nd edition, 6: 13. 1874) gives an uncolored illustration from a drawing of a double-flowered daylily named Yabukwanzo. In a later edition this plant was identified as *H. fulva* L. var. *Kwanso.* Various publications on Japanese plants mention this double-flowered fulvous daylily as rather widely cultivated in Japan.

The first introduction into Europe of a double-flowered fulvous daylily was by a Rev. W. Ellis, who brought living plants from Mauritius. The firm Veitch & Son exhibited this plant under the name *H. disticha flore-pleno* before the Floral Committee of the Royal Horticultural Society in London during 1860, receiving for it a First Class Certificate (Gard. Chron. 1860: 482). A year later a colored plate was published (The Floral Magazine 1: *pl. 13*) which is in very poor coloring but shows a flower that is much doubled. The excellent volume which surveys the botanical and horticultural contributions of the Veitch firm mentions (Hortus Veitchii, 446. 1906) the daylily introduced from Mauritius as *H. fulva* var. *flore-pleno* and says of it " A semi-double form of the common Day Lily, with spikes of orange flowers similar in color to the type, possessing the important quality of remaining longer on the plant."

Soon after the introduction of the fulvous Daylily Flore-Pleno by Veitch & Son, plants known as *H. fulva Kwanso* were brought into Europe directly from Japan by von Siebold. The first mention of this plant appears to be a mere note in the Gardeners' Chronicle (1864: 654) that a plant of "*Hemerocallis Kwanso foliis variegatis*" had been exhibited. Two years later a plate in good color, showing the double flower and the white-striped or variegated foliage of this plant was published (Gartenflora 15: *pl. 500.* 1866).

The Gardeners' Chronicle in 1867 (32: 292) speaks of this plant introduced by von Siebold under the name *Hemerocallis Kwanso flore-pleno* and states that it "is merely a variety of *H. fulva*, with the leaves more or less distinctly marked with white stripes, and the tawny-red flowers filled out with a tuft of smaller petaloid segments in the center."

Thus it appears that the *H. fulva Kwanso* first introduced was variegated as well as double-flowered. The variegation is evidently of the chimeral type and plants with this type frequently produce all-green branches. Hence it may well be that some of the double-flowered plants with all-green foliage now in cultivation arose from the Kwanso Daylily.

The propagation of these two daylilies is solely by vegetative means. It can not be otherwise, for the pistils of the flowers are entirely impotent. The two types are merely clons.

It is generally considered that the clon of the Daylily Flore-Pleno introduced by Veitch & Son is less double than the Daylily Kwanso. It is to be noted, however, that these conditions are exactly reversed in the first illustrations of the two. The plate of von Siebold's plant published in 1866 (Gartenflora, *pl. 500*) shows a semi-double flower, while that of Veitch's plant (The Floral Magazine 1: *pl. 13*) shows a flower much more double. The writer has obtained entirely green-leaved plants under both names Kwanso and Flore-Pleno from various nurserymen and from various botanical gardens. These have been grown side by side for comparison and study. There seems to be no difference in the color of the flowers and the various aspects of the habit of growth. Some plants, however, have all flowers very double, while other plants have semi-double flowers, with also many inter grades; various grades of doubleness may be found on the same plant.

In 1924 Mr. Henry H. White, of the Department of Agriculture, American Presbyterian Mission, in Anhwei, China, sent to The New York Botanical Garden living plants of daylilies which he had collected from an old abandoned cemetery. These plants have green leaves and bear flowers of various grades of doubleness with many flowers only semi-double.

When plants of the Europa Daylily are grown beside plants having double flowers the former are earlier to bloom, have foli-

age somewhat less coarse, and have taller scapes. The color of the flowers is the same. The zone or eye spot is, however, less developed in the smaller and inner accessory segments of the double flowers than in their more primary segments and in the petals of the single-flowered Daylily Europa.

Of the origin of the double-flowered type there is no record. It was in existence in Japan in 1712 and it is known to be now rather widely distributed in Japan and probably also in China, both in culture and as an apparent escape, evidently quite as the Daylily Europa now exists in such old-settled areas as Long Island about abandoned homesites, along roadsides, and wherever the activities of man have given the plant a chance to spread vegetatively. All the distribution of the double-flowered fulvous daylilies in the Orient as well as in Europe and in America has been by vegetative propagation. The very close relationship between the double-flowered types Kwanso and Flore-Pleno and the single-flowered Daylily Europa is obvious. The double-flowered type probably arose either directly from the Daylily Europa as a bud-sport, or it may have been a seedling member of the same race. Some evidence bearing on the origin of these rather anomalous types of fulvous daylilies will undoubtedly be obtained from the character of the seedlings derived from using them in cross breeding.

The double-flowered daylilies have not become popular garden flowers. The color of the flowers is perhaps too dull. The flowers also seem monstrous, coarse, and lacking in pleasing symmetry. As in the case of the double-flowered true lilies (*Lilium tigrinum flore-pleno*, for example), they are not very attractive. Besides, the flowers stand rather high above the leaves. Possibly double-flowered daylilies may yet be developed with sprightly colored and more symmetrical flowers, and with a more pleasing habit of growth.

3. Fulvous Daylilies with Variegated Foliage

Thunberg in his volume on Japanese plants (Flora Japonica, page 142), published in 1784, makes mention of a white variegated variety of what he called *Hemerocallis fulva.* He also speaks of varieties with simple and with double flowers but does not say which had the variegated foliage. A daylily with varie-

gated leaves is mentioned in 1829 (Roemer & Schultes, Systema Vegetabilium) as a variety of *H. disticha* and since a variety with "pleno" flowers is also mentioned one might infer that the variegated plants were single-flowered. In the various descriptions of the double-flowered fulvous daylilies usually there is no mention of variegated leaves. In 1864, The Gardeners' Chronicle (page 654) mentions the display of a "*Hemerocallis Kwanso foliis variegatis*" and states that it was a "well-marked variegated plant, very near the variegated variety of *H. fulva.*" Evidently the *H. fulva Kwanso* introduced from Japan by von Siebold was both double-flowered and variegated, according to the plate of it published in 1866 (Gartenflora **15**: *pl. 500*) and the early description of it.

From time to time after 1866 two sorts of variegated daylilies have been mentioned. One with single flowers is usually called *H. fulva variegata*; one with double-flowers is generally known as *H. fulva Kwanso variegata.* The latter has been spoken of as "almost as striking in appearance as the well-known *Pandanus Veitchii,* which at first sight it somewhat resembles" (Gard. Chr. **51**: 681. 1882).

The variegated daylilies are seldom offered in the trade either in single or in double flowers. It is possible that plants of one or of both of the variegated forms exist in certain gardens in America, but if so the writer has not heard of them. Through the special efforts of Director Fred J. Chittenden, of the Royal Horticultural Society Gardens at Wisley, England, The New York Botanical Garden has at last received plants of variegated daylilies, which, however, are yet to come into bloom.

There appears to be no accurate description by which one may determine whether the flowers of the single-flowered variegated daylily are like those of the Daylily Europa or are different. For a more precise description and a correct naming of the clon or the clons of the variegated daylilies, the flowers are necessary.

A. B. Stout.

AMERICAN IRIS–BREEDERS[1]

A general idea of the Iris situation in Europe and America during the Nineteenth Century is necessary before we can take up the subject of American Iris-Breeders and their work, because there are no records to show that any serious breeding of Irises was done here during the last century.

In Europe wild species and collected forms of wild or escaped garden hybrids were all that we have definite information about until about 1833, when a German amateur botanist, E. von Berg, described his seedlings in the journal "Flora." After him we know of another amateur, a Parisian this time, M. de Bure, who recorded his work in 1842. He was followed by M. Jacques, a famous French horticulturist, head gardener for the King at Neuilly. He raised seedlings and distributed them among nurserymen and amateur gardeners and probably the well-known varieties before those raised by M. Lémon were described, were all raised by Jacques. Lémon's collection of Irises was first described in 1839 in the *Revue Horticole*, but these two men worked along about the same period. Apparently everyone of them merely collected seed from the plants they had and sowed it, selecting the best and most unusual colors to retain. M. Lémon was followed by a M. Pelé, mention of whom is made in the *Revue Horticole* in the year 1845–46, and then came the Verdiers and M. Modeste Guérin. In 1850 we find John Salter, an Englishman, introducing Irises raised by himself. The varieties produced by these men seem to have held the field until the end of the Nineteenth Century, for a thorough search of catalogues both in Europe and the United States, will show no other names except misspellings and synonyms, with the exception of a very few varieties raised by Robert Parker, an Englishman, and possibly by Mr. Barr. Sir Michael Foster had begun his collection and had started to hybridize but few of the seedlings were introduced before 1900. Few of the newer introductions reached the United States until the first decade of the Twentieth Century had passed.

The Irises, then, that were known and grown here were these same old French and English varieties, many of them introduced

[1] Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, June 1, 1929.

nearly seventy-five years before. Nearly all of them were short of stature, dull in color, and poor in form, with closely held " falls " and the flowers crowded on the stems.

Bertrand H. Farr was the man who began seriously to raise new Irises in this country but first of all he got together as good and representative a collection of plants as he could find in commerce. He hybridized and in 1909 he first listed seedlings of his own raising. Among these were *Windham, Wyomissing, Quaker Lady, Juniata, Montezuma,* and *Mount Penn,* all of which are still good garden subjects. Mr. Farr chose his seedlings carefully. He compared them with the best things in commerce at the time, for he had them growing side by side in large blocks or wide lines in his nursery. Practically all seedlings raised and introduced by Mr. Farr are good growers and bloom freely, giving a fine garden effect. The poorest " doer " of his good introductions is a Plicata, *Anna Farr,* which is claimed by some to be difficult. Given suitable conditions, though, for the general run of Bearded Irises, that is good drainage, ordinary garden loam, and sunlight, even *Anna Farr* makes a satisfactory response, growing far better than some of the newer sorts raised by others of *Ricardi* parentage. The best varieties raised by Mr. Farr are *Mary Orth, Georgia, Mildred Presby, Seminole,* and *Apache.* These four rank well up with the best there are. *Seminole,* a dark, red bicolor, was certainly outstanding as a seedling when seen in the nursery at Wyomissing and is considered of great value, not only here but abroad. *Mildred Presby,* with very pale yellow standards and red-purple falls, is far and away the best of its class to date. In the breeding work done by Mr. Farr we find him using well-tried varieties. I know he did not bag the flowers after he made the crosses and he *did* keep some records but I think he followed no definite plan laid out ahead. The parents he used were practically all of them of uncertain origin with generations of unknown mixtures behind them, so the probability was that almost anything might appear among the progeny. This is the case with all Iris seedlings except where two definite species have been crossed, and the flowers bagged to protect them from outside contamination. Hardly a breeder here has raised and introduced a seedling that can be said to be free of the uncertainty that some foreign element has been introduced.

The variety of types and the concentration upon only introducing a good grower, a flower of clear color, and a variety greatly advanced over those belonging to the same color-group are what has given Mr. Farr's work that lasting quality that breeders and introducers should strive for.

Irises are so easily raised from seed that many who do not know existing varieties will rush into the breeding game and if they get something a great deal better than the very poor old sorts they used as parents, they think they have something wonderful. As, about the year 1900, only a very few people in America had any plants of the best European varieties, those who used just what they had or who bought from old nursery stock, were obviously behind Mr. Farr, who had used the best he could find in the world at the time. The English and French were well ahead of us but the strides made in the last fifteen years in this country are enormous and now we have dozens of varieties which, as they have been raised under our own climatic conditions, often grow better than the imported ones. Our present breeders who produce fine varieties are most of them working on the theory that they will not start at the beginning but, to catch the Europeans, they must get the best of the European varieties and work on from there. Naturally they are right about not being left behind in the race, but that leaves all their seedlings, except in the case of a very few varieties, based on uncertain foundation from the scientific point of view.

The next American breeder of note is Miss Grace Sturtevant, who introduced seedlings of her own raising as early as 1917. She is a careful breeder, keeping records, working along lines laid out, and following deductions gained from her earliest work with seedlings. She has been an inspiration to most of those producing the finer things. Color and good form interest her and she has definitely worked for better pinks, and above all, for yellows and whites. She has been successful with the yellows and has many good ones to her credit, among the most famous being *Shekinah,* and yet newer, *Primrose*, *Chalice,* and *Sunlight.* She won high honors with Irises as early as 1915, and she and her brother, Robert Swan Sturtevant, with one or two others, may be considered to be the backbone of the Iris movement in the United States. The new way of selling flowering plants by growing

them in a real garden in conjunction with other suitable subjects that bloom at the same time is well shown at Miss Sturtevant's Glen Road Iris Gardens. Better catalogues as well as better Irises are a part of her influence on the Iris world. She gives in her catalogue good descriptions, cultural instructions, dates, and names of originators and introducers, with ratings, and all is put so clearly and conveniently that the public is bound to take notice.

Miss Sturtevant is an amateur whose hobby has become a business and you find many of these among American Iris-Breeders. Mr. Farr intended to be a musician but he gravitated through peonies and other fine plants into the nursery business, and Mr. E. B. Williamson, the raiser of the deservedly famous Iris, *Lent A. Williamson,* is an entomologist, an authority on dragon-flies. Many who are doing serious work now in the Iris field are professors in our great universities or members of the Department of Agriculture. Among these are Dr. Kirkland, Chancellor of Vanderbilt University; Dr. Essig and Dr. Mitchell, of the University of California; Dr. S. Stillman Berry, Mr. Robert Van Name, Mr. J. Marion Shull, Mr. Benjamin Y. Morrison, Mr. Charles E. F. Gersdorff, and many others. Then there are amateurs, enthusiasts about Iris, such as Mr. Clarence Connell, who is the superintendent of a great hosiptal; Dr. Wylie McL. Ayres, an oculist; Mr. John Dee Wareham, Vice-president of the Rookwood Pottery; Mr. F. Cleveland Morgan, and many who began as amateurs but have gone into selling through their seedlings.

To return to Mr. Williamson. Realizing the uncertainty through using parents whose antecedents one knows little of and noting that plants which were pollenized by insects more often produced seed that grew, he decided to choose special seed parents but to mix the pollen.

This has resulted in a tremendous amount of variation among his seedlings and gives much food for thought. Mr. Bliss, an English breeder of fame, produced a remarkably different Bearded Iris from any then known. This plant has very velvety falls and is known as *Dominion.* He then used *Dominion* pollen and made a race of magnificent varieties known as the *Dominion* strain. Our Americans have, most of them, used *Dominion* or *Dominion* children in their work and by so doing are rewarded by a very distinct advance, but the queer thing is that plants appar-

ently identical with *Dominion* children and grandchildren have been produced by breeders who have never used *Dominion*! Mr. Williamson is one of these. Most of his finest new varieties are descendants of *Lent A. Williamson* and if you look in his catalogue (Longfield Iris Farm, Bluffton, Indiana) you will see that mixed pollen was generally used. *Dolly Madison, George J. Tribolet, Cinnabar, Jane Williamson, Tuscany Gold,* and many others can rank with the uppermost.

At the same time Miss Sturtevant and Mr. Williamson were starting their work, Mrs. Frances Cleveland, of Eatontown, New Jersey, had ventured into crossing Beardless Irises, working mostly with the Siberian sorts, and, with the exception of the John Lewis Childs nursery, of Flowerfield, L. I., is the only American breeder who has really done much in this line. Her introductions have added materially to the charm of our gardens by giving us lighter blues, clearer tones, and much more handsome flowers. John Lewis Childs, Inc., have concentrated upon Japanese seedlings and have selected many fine things and propagated them, so that they now are the only nursery in this country which has a large number of Japanese varieties true to name and at the same time distinct from older varieties.

Breeding with a definite plan has been done longer, perhaps, by Dr. Sidney Mitchell, of Berkeley, California, than by any of our breeders. The late Mr. William Mohr, who had been at work with Irises a number of years before his tragic death, started with true scientific care and accuracy. He kept records and he sowed seed of only the particular line he wished to trace. He began with a very *few* crosses and *sowed all of the seed.* Of the children again mated, he *sowed all the seed.* Checks on results are possible this way and in no other. The enormous amount of seed produced would soon put anyone on the bankrupt list if all seed of a great many crosses were planted. The percentage of fine Irises produced by Mr. Mohr and by Dr. Mitchell, who inherited his plans, records, and plants, during the few years the work has been going on, is equalled only by the work of Mr. A. J. Bliss in England and by that of the firm of Cayeux and LeClerc in France. From a great many seedlings only a few Irises will be at all outstanding; therefore, the man who plants all seed from a *few*

very *good* crosses has the most chance to find something extra choice and something he will want to select to carry on the family.

It is interesting to note the definite types a breeder's seedlings will run in, and particularly is this shown by the varieties raised by Mr. Hans P. Sass and his brother, Mr. Jacob Sass, of Omaha. These men are very successful in raising sorts that are fine growers, very floriferous, and which have a frilly effect to the petals. Their range of colors, too, is unusual, and their selections have been only of those things that were outstandingly different from what was already in commerce at the time their seedlings were brought out. *King Karl, Jubilee, Midwest, Lona,* and *Padusoy* are good examples of this.

Our Iris breeders are not confined to any one section of the country, for an inspection of the list of their names and addresses in the American Iris Society's new Check List will show them from nearly every state in the Union. Perhaps they may be known for only one introduction, as the late Arthur H. Scott, with *Steepway,* or with a dozen or so, including one having a Silver Medal to its credit, as Mr. J. Marion Shull with *Morning Splendor, Coppersmith, Sequoiah,* etc., and Mr. Charles H. Hall with two medal-winners, *Chartier* and *Aliquippa* among a mere dozen. Or again, for many varieties which were good for their period and which are not so well rated now, perhaps, but still with a few fine garden subjects worth having, as Mr. Willis E. Fryer, of Mantorville, Minnesota, or for the diversity of interest among the different Iris groups, as Mr. Howard E. Weed, of Beaverton, Oregon, or, for their interest in the *Dominion* race and progeny and production of immensely tall and startling varieties, as the Cincinnati group, which includes Mr. Wareham, Dr. Ayres, Mr. Lewis R. Smith, and others. We must not forget Mrs Ella Porter McKinney and the late Mr. Sam Burchfield for their work with the Dwarf Bearded varieties, a field that needs more workers.

It is a wide field and not the least interesting is the work being done at The New York Botanical Garden under the auspices of the American Iris Society and the direction of Dr. Arlow Burdette Stout, testing sterilities, and, with the aid of wonderful new native varieties discovered and collected by Dr. John K. Small, trying to give us hardy Irises in colors other than what we have in

blues and whites. Each and all of these people are helping horticulture in this country and even to glance at the surface of such work is to realize that the scientist, the amateur, the commercial grower, and the professional gardener are alike in the work, trying to give us something better than that we already have.

ETHEL ANSON S. PECKHAM.

TULIPS AND DAFFODILS IN HOLLAND[1]

The Tulip has been the most important flower in Holland since about 1600. It came there by way of Vienna, having been brought by the Austrian Ambassador to the Sultan from Constantinople to Vienna in 1554. The Dutch nurserymen quickly made the flowers very popular and there was a great demand for them all over Europe.

In 1634 there began one of the most interesting events in the history of horticulture and for three years there existed the so-called Tulip Mania. During this period Dutch speculators bought and sold tulips at constantly increasing prices and tulips became almost as valuable as diamonds, there being record of single bulbs being sold for more than $10,000. This speculative period brought about the establishment of stock exchanges in every little village where bulbs were sold daily at auction, and prices kept increasing until the final crash in 1637.

At that time the bottom fell out of the market and bulbs which had been worth fabulous sums became valueless. The Dutch Government officially stepped in and courts were kept busy for several years in the bankruptcy proceedings and suits for payment for bulbs previously contracted for. As a warning against such speculation in the future the Dutch Government lent its influence to the publication of a book, giving the history of this period, and it is interesting to note that one hundred years later when there was the prospect of a similar mania in hyacinths this book was reprinted as a second warning and speculation in hyacinths was checked.

After 1637 the tulip fell into temporary disfavor and other flowers surpassed it in interest, but it gradually crept up again,

[1] Abstract of an illustrated lecture given at The New York Botanical Garden, Saturday afternoon, May 4, 1929.

until today it is again the most popular flower in Holland and now over 10,000 acres are needed to produce bulbs, which are shipped to all parts of the world. It is estimated that the output of tulips from Holland last year was over 500,000,000 bulbs.

The Dutch Bulb District lies between The Hague and Amsterdam, covering roughly a piece of ground thirty miles long by ten or fifteen miles wide. Every little village has its dozens of nurseries—some small, others totaling hundreds of acres. The land is low and sandy and is planted to a rotation of groups lasting about five years, this rotation including vegetables, tulips, hyacinths, daffodils, and other bulbs. Small canals divide the fields, and instead of using wheelbarrows, carts, or motor trucks, all transportation of bulbs is by water.

The tulips brought from Constantinople in 1554 were but few in variety of color, height, and season. Plant breeders during the last centuries, however, have produced many marvelous colors and larger and larger flowers. A good idea of the modern tulips can be obtained at The New York Botanical Garden, where, through the generous gift of the Dutch Bulb-Exporters' Association, nearly 100,000 plants may be seen in bloom each year. Most of these are of the modern garden types but some wild tulip species from various parts of Asia may also be seen, some of them being only a few inches high and hardly bigger than a crocus.

The daffodil is native to England, France, Spain, and other countries of northern Europe, but it also has been grown in Holland commercially for many years and an acreage second to that only of tulips is required to produce the bulbs there. It is a more modern flower from a gardener's point of view, however, for most of the good garden kinds dating back not more than fifty years were produced by English plant-breeders rather than by Dutch. After the new varieties had been produced in England, however, they were quickly shipped to Holland to be grown in commercial quantities, and there have always been a few Dutch nurserymen who have made a business of breeding daffodils.

The culture of both these flowers is exceedingly simple in this country. They should be planted in early fall and they bloom the following spring. Under congenial conditions daffodils will increase from year to year, but in most northern gardens tulips will decrease and tend to die out, so that new bulbs must be pur-

chased every three or four years. They are so cheap, however, that even the most modest gardener can afford to get a few new bulbs yearly, and it is hard to think of any investment which can give as much pleasure in flowers as a few dollars devoted to purchasing bulbs.

JOHN C. WISTER.

THE 1929 TULIP DISPLAY

The 1929 Darwin Tulip Display is partially represented in the accompanying figure. The varieties shown increased over those of 1928 by inclusion of about six new varieties. Among the outstanding sorts were Zwanenberg and Citronella. The new white, which was awarded a merit certificate at the Haarlem Show in 1919 was characterized by Mr. Joseph Jacob when he visited the tulip fields in Holland as the best white Darwin. Zwanenberg has black anthers and is said to turn "wishy-washy" by some growers but as seen in our collection it was a remarkably clear tulip. Citronella is rather a pale yellow as compared to some of the good tones in the Cottage tulips but has all of the length and strength of stem and the shape of the Darwin flowers. The large oval bed in the illustration, which has often been the best bit of tulip planting on our grounds, usually with fine bulbs of Farncombe Sanders, was this year planted with Prince of the Netherlands, edged with the variety Clara Butt. This planting was fully as showy as in other years. The Prince of the Netherlands stock which the Holland growers sent was the best we have ever had and one of the favorite Darwin varieties of many who saw the collections. Another variety which should be mentioned is Jacob Maris, a fine scarlet, white-based variety, which is about five years on the market and exhibited here for the first time. The oddest tulip ever planted in our displays was Sundew, which has fringed edges and upper inner sides of petals, reminding one of the sundew.

The most new varieties were among the Early, Cottage, and Breeder tulips planted in the court of Conservatory Range No. 1. The famous Carrara, which was first called a Darwin and later put in the Cottage class, attracted a good deal of attention. It received an award of merit in 1921 and has been called the clearest

and cleanest of the white late tulips. The blooms are globular, large, and on sturdy and strong stems. Rosa Bella, a soft pink Cottage tulip which many experts criticised when viewing the flowers towards the end of their blooming period made the same impression here but it is said that the early colors are excellent and caused the Holland people to recommend it very highly. Other new Cottage varieties displayed were General French, a large pink sort; Leda, a deep carmine-pink; Amber, amber-colored, which was given an award of merit in 1924 by the Royal Horticultural Society, and Ambergris, a crimson edged and shaded orange. Breeder tulips, new to our collections, are Melva, Ilias, Tricolor, Vinsor, and Black Diamond. In all about one hundred and fifty varieties were exhibited.

KENNETH R. BOYNTON.

CONFERENCE NOTES FOR APRIL

The regular Monthly Conference of the Scientific Staff and Registered Students of the Garden was held on the afternoon of April 10. A special feature of the hour was the illustrations of the topics presented by the use of a new opaque projector and daylight screen, apparatus recently purchased by The New York Botanical Garden:

"Experiments in Breeding Gladioli" was the subject of a presentation by Dr. Forman T. McLean and the following is his abstract of the discussion:

The garden varieties of gladiolus are so diverse that they offer excellent opportunities for breeding experiments and for studies of inheritance. They are the offspring of intercrossing about ten or a dozen wild species from South Africa, and so there is apt to be great diversity among the seedlings from them. There are scores of other wild forms in South and Central Africa, Asia Minor, and Southern Europe that offer equal or greater opportunities for hybridizing. But the breeding work with gladiolus has been largely haphazard, and little is known about the ancestry of most of the garden varieties, except the broad general facts about the species and types from which they were derived.

Among the careful workers of the past may be specially mentioned Dean William Herbert, of Manchester, England, who in-

terested himself in hybridizing gladiolus species from about 1
until nearly the time of his death in 1847, and Dr. Walter '
Fleet, who used a number of the species for crossing with
garden hybrids during the last decades of the past cent
Neither of them appeared to have considered it desirable to c
their species hybrids to a second generation, so many of their
sults were rather inconclusive.

The speaker's experiments have disclosed a few things ab
inheritance, fertility, and the cytology of the gladiolus, and gi
basis for further, more detailed, studies.

The garden varieties of gladiolus show a variety of herit
traits; color, size of bloom, flower shapes, color patterns, and o
are clearly inherited traits. Crosses between varieties of diffe
colors show inheritance largely in proportion to their pedigr
The large-flowered types are the offspring of crosses involv
two red species, one of which, *G. Saundersii,* was introduced
the admixture quite recently. Accordingly, red is quite a do
nant color. On the other hand, Primulinus hybrids, derived f
the yellow gladiolus *G. primulinus,* show strong inheritance
yellow in the first generation, but if crossed with dark-colore
non-yellow forms for two or three generations, this yellow co
ing is no longer conspicuous in the seedlings. Likewise, vari
odors formed in the garden varieties are quite definitely inheri
A rather strong ill scent, a faint musky odor, and a very f
sweet odor can be detected in some varieties, and can be trace
their seedlings, but none of these have appeared strongly eno
in any of the seedlings to make them traits of horticult
interest.

The strong odor at night, slender, strongly ribbed leaves,
habits of growth of *Gladiolus tristis* are all characters ea
traced when they occur in seedlings from crosses between
species and garden varieties. The odor is strongly recessive
has scarcely appeared in the hybrid seedlings, only six per c
of the seedlings showing even perceptible odors. Other scer
species are being studied, and some of them, while less amen
to either culture or hybridizing, are showing promise of ha
characters for fragrance which are dominant in seedlings. Th
are now eight sweet-scented species of gladiolus in cultivatio
the Botanical Garden, among the 40 species being grown h

and this characteristic is being further tested in breeding experiments.

A number of rather annoying incompatibilities and sterilities have cropped up in these breeding experiments. First, many of the clons of gladiolus species and hybrids are self-incompatible. Seedlings of most of the large-flowered varieties and of the species *Gladiolus Quartinianus, G. dracocephalus, G. Saundersii, G. psittacinus, G. recurvus, G. grandis, G. byzantinus,* and *G. communis* are apparently self-incompatible, while plants of several of the Primulinus hybrids and of the species *Gladiolus primulinus, G. splendens,* and *G. tristis* are frequently self-compatible.

Hybrids among gladioli are frequently of reduced fertility. Pollen of garden varieties usually appears to have a germination of about 50 per cent. in 5 per cent. sugar in agar. Most, if not all, hybrids between *G. tristis* and garden varieties show reduced fertility, being non-productive of seed and the pollen showing a germination of four per cent. or less. Crosses between closely related species such as *Gladiolus tristis, G. recurvus,* and *G. grandis*; and between *G. psittacinus, G. Saundersii, G. primulinus,* and *G. Quartinianus,* and *G. dracocephalus* appear both easier to effect and to produce more fertile hybrids than wider outcrosses between *G. tristis* and *G. cardinalis,* which is nearly sterile; *G. cardinalis* and *G. floribundus,* which is of low fertility, etc.

Pollen of gladiolus is furthermore short-lived, and retains its viability for less than a day. Successful crosses, therefore, need to be made with fresh pollen. Pollen one day old, of highly fertile varieties and species, show a germination of about one per cent. Older pollen has given completely negative results.

In an effort to account for the sterility of hybrids between *G. tristis* and garden varieties, the chromosome number in dividing pollen mother cells was studied. This was found to be uniformly 14 as the haploid number in *G. tristis, G. Quartinianus* and the varieties Theda, Dorothy Wheeler, and Joe Coleman.

In a few hybrids a rather puzzling type of results was obtained. Successful setting of seed of gladiolus varieties with *Acidanthera bicolor,* with pollen of *Freesia,* and with *Gladiolus nanus* pollen, and also of large-flowered varieties with *Gladiolus grandis* pollen were obtained, but in each case the seedlings showed inherited characteristics from the seed parent only. Repeated efforts to

effect these crosses have met with similar results, except the last in which we now apparently have some intermediate seedlings not yet flowered.

Dr. A. B. Stout spoke on "New Species of Hemerocallis," including in this group those species that have been named since 1890. New evidence on the wild types of the fulvous daylilies was also presented and the origin and development of a red-flowered strain was discussed. One species, to be described for the first time in the June issue of *Addisonia,* was illustrated. The presentation and the numerous illustrations of paintings and photographs were largely from plants that are being grown at The New York Botanical Garden for use in breeding work. Rather complete descriptions and illustrations of the various species and of certain hybrids will soon be published in numbers of this Journal and of *Addisonia.*

A. B. STOUT,
Secretary of the Conference.

LEGACY OF MR. JAMES B. FORD

The Garden has received from the executors of the last will and testament of Mr. James B. Ford an unconditional legacy of twenty-five thousand dollars; his name has been enrolled among the Benefactors of the institution. Mr. Ford was a Life Member since 1899, a Fellow for Life since 1905, and a Patron since 1913. He contributed liberally to many of the funds subscribed for special purposes from time to time.

LEGACY OF MARY A. DILL

The New York Botanical Garden received on May 2, 1929, from the executors of the last will and testament of Miss Mary Ann Dill, a check for ten thousand dollars, as an unconditional legacy, which has been added to the endowment of the institution.

Miss Dill had been an annual member of the Garden since September 15, 1896, thus being one of the first, and was much interested in its work and development, visiting it occasionally; she died on May 15, 1928.

NOTES, NEWS, AND COMMENT

Dr. A. B. Stout gave an address by invitation on "Physiological Incompatibilities in the Fertilization of Plants" before the New York Medico-Surgical Society on May 18th.

A meeting of the Bronx Society of Arts and Sciences was held at the Garden on the afternoon of Saturday, May 4, 1929, with an attendance of 50 members and their friends. Dr. Britton spoke briefly upon the major features of the institution and the more recent developments, and subsequently escorted the party to several points of interest, twelve motor-cars being in line; stops and comments were made at the northern end of the Hemlock Grove, the pot-holes, and the Boulder Bridge; the Cherry Garden, and Thorn and Crab-Apple collections; the valley proposed for a Rhododendron Glade, now under construction; the plantation of daffodils, Darwin and Breeder Tulips, Dwarf Irises, and the adjacent Rock Garden; and the court of Conservatory Range No. 1, to view the collection of Early Tulips and Cottage Tulips.

Meteorology for April. The maximum temperatures recorded at The New York Botanical Garden for each or part of a week were: *92½° on the 7th;* 89½° on the 8th; 62° on the 21st; and and 70° on the 26th. The minimum temperatures recorded were: *31° on the 2nd;* 32° on the 13th; 36° on the 16th; and 36° on the 23rd. The last freezing temperature occurred on the 13th of the month. The total precipitation for the month was 4.84 inches.

ACCESSIONS

Museums and Herbarium

1 specimen of *Ustilago echinata* from Michigan. (By exchange with Professor Don M. Benedict.)

3 specimens of fungi from various localities. (By exchange with Mr. John Dearness.)

1 specimen of *Orbilia* sp. from Montana. (By exchange with Dr. P. A. Young.)

4 specimens of fungi from Colombia. (By exchange with Mr. Carlos E. Chardon.)

1 specimen of *Mollisia Lycopodii* from New Hampshire. (By exchange with Dr. Roland Thaxter.)

1 specimen of *Pycnoporus sanguineus* (L.) from Brazil. By exchange with Professor J. W. Harshberger.)

20 specimens of cup-fungi from Sweden. (By exchange with Dr. John A. Nannfeldt.)

1 specimen of *Sphaceloma Symphoricarpi* from Ithaca, N. Y. (By exchange with Mr. James G. Horsfall.)

8 specimens of *Sclerotinia* from New York. (By exchange with Professor H. H. Whetzel.)

100 specimens of fungi ("Mycotheca generalis," Nos. 1–100). (Distributed by Dr. Franz Petrak.)

29 specimens of "Fungi Dakotenses," Fascicle 26. (Distributed by Dr. J. F. Brenckle.)

7 specimens of fungi from Europe. (By exchange with Professor Hans Sydow.)

13 specimens of fungi from Tennessee. (By exchange with Professor L R. Hesler.)

Plants and Seeds

1 plant for Rock Garden. (Given by T. H. Everett.)

1 plant for Conservatory. (Given by Herman Jonson.)

12 plants for Conservatory. (Given by Dr. A. Butler.)

13 plants for Conservatory. (Given by Mrs. J. N. Henry.)

1 plant for Conservatory. (In exchange with E. P. Ingram.)

7 plants for Conservatory. (Collected in Arizona by Count F. M. Knuth.)

21 plants for Conservatory. (In exchange with Carl Purdy.)

72 plants of Iris for study. (Collected in Florida by Dr. J. K. Small.)

6 plants for Conservatory. (Given by Miss Alice Eastwood.)

101 plants of Japanese Cherries. (Given by Mr. S. B. Moffitt.)

3 plants for Conservatory. (Given by Mrs. P. Jantzen.)

1 plant for Conservatory. (Collected by Mrs. N. L. Britton.)

1 plant for Conservatory. (Given by Mrs. Long.)

1098 plants of Iris. (Collected by Dr. J. K. Small, in Louisiana.)

2 plants for Nursery. (In exchange with W. W. Ashe.)

14 plants of Iris. (Given by Longfield Iris Farm.)

17 plants for Conservatory. (Collected by Dr. J. K. Small.)

2240 plants for Plantations. (Purchased.)

4 plants for Rock Garden. (Given by H. J. Cottle.)

300 plants of *Pinus rigida.* (Purchased.)

200 plants for Rock Garden, etc. (Purchased.)

2 plants for Herbaceous Ground. (Given by E. A. Rau.)

240 plants for Phlox and Aster Border. (Given by Wayside Garden Co.)

PUBLICATIONS OF

THE NEW YORK BOTANICAL GARDEN

Journal of The New York Botanical Garden, monthly, containing notes, news, and non-technical articles. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. Now in its thirtieth volume.

Mycologia, bimonthly, devoted to fungi, including lichens; $4.00 a year; single copies not for sale. [Not offered in exchange.] Now in its twenty-first volume.

Addisonia, quarterly, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Subscription price, $10.00 a year. [Not offered in exchange.] Now in its fourteenth volume.

Bulletin of The New York Botanical Garden, containing reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations. Free to all members of the Garden; to others, $3.00 per volume. Now in its thirteenth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes. Roy. 8vo. Each volume to consist of four or more parts. 61 parts now issued. Subscription price, $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Memoirs of The New York Botanical Garden. Price to members of the Garden, vols. I–VI, $1.50 per volume; to others, $3.00. Vol. VII, $2.50 to members; to others, $5.00.

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. ix + 492 pp., with detailed map. 1900.

Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. xvi + 320 pp., with 176 figures. 1903.

Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. xiii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 478 pp., with 73 figures and 14 plates. 1908.

Vol. V. Flora of the Vicinity of New York: A Contribution to Plant Geography, by Norman Taylor. vi + 683 pp., with 9 plates. 1915.

Vol. VI. Papers presented at the Celebration of the Twentieth Anniversary of The New York Botanical Garden. viii + 594 pp., with 43 plates and many text figures. 1916.

Vol. VII. Includes New Myxophyceae from Porto Rico, by N. L. Gardner; The Flower Behavior of Avocados, by A. B. Stout; Descriptions of New Genera and Species of Plants Collected on the Mulford Biological Exploration of the Amazon Valley, 1921–1922, by H. H. Rusby; and The Flora of the Saint Eugene Silts, Kootenay Valley, British Columbia, by Arthur Hollick. viii + 464 pp., with 47 plates, 10 charts, and 11 text-figures. 1927.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. In the thirteenth volume.

THE NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of narcissi, daffodils, tulips, irises, peonies, roses, lilies, water-lilies, gladioli, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than one million specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 38,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural, and forestal subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————

All requests for further information should be sent to

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THE COCONUT-PALM—COCOS NUCIFERA

EARLY HISTORY[1]

As in the case of many of the plants that have served man from nearly every economic standpoint, from prehistoric times to the present, the nativity of the coconut-palm is uncertain. The geographic origin of the coconut has long been a debated question. Some have argued for an Old World origin; others for a New World origin. There seems to be no evidence pointing to the probability of American origin, except that based on the supposition that its closest relatives were American. But, when we know that the several kinds of palms referred to the genus Cocos, except *Cocos nucifera,* are not closely related to the latter, and really belong to a different genus, the argument for the American origin of the coconut-palm fails. Furthermore, the so-called Cocos which was observed in northern South America by Cieza de León[2] was described by him as a palm, the nuts of which, when pounded in water, yielded a fat of the consistency of butter under ordinary temperatures, but liquefying when slightly heated. These he called *Cocos butyracea.* In an incorrect English translation it was stated that milk flowed from this nut when broken and it was consequently inferred that Cieza de León was speaking of *Cocos nucifera.* Specimens of oil-yielding nuts from this

[1] Adapted from a letter received from the late William E. Safford.

[2] Pedro de Cieza de León was born in 1518, at Llerena, in southwestern Spain. In 1534 he went to Peru, apparently in the army of Hernando Pizarro, and served there for seventeen years, returning to Spain in 1552. His chronicle of Peru, of which the first part was published during his lifetime, two more parts in modern times, and further fragments still exist in manuscript, is regarded as the most reliable work on the early history of Peru. He died at Seville in 1560.—JOHN HENDLEY BARNHART.

region do not belong to the genus Cocos, but to a genus closely allied to Attalea.

As far as the evidence goes, there is not one early writer who regarded the coconut as native of America. Piso,[3] after describing the native palms of Brazil, continues his list of palms with the coconut, which he expressly declares to be exotic. Aublet[4] states

[3] Willem Piso was born in 1596, at Leyden, Holland, where he studied medicine and entered on the practice of his profession. In 1636, the Dutch West India Company appointed Jan Maurits, Count of Nassau-Siegen, governor of all its territories in Brazil, where it had secured a precarious foothold a few years before, and on the west coast of Africa, where, at that time, it held nothing at all. The Count chose several scientific gentlemen to accompany him, among them being the Dutch physician Piso and the German physician Georg Marggraf (1610–1644), then studying in Holland. They landed at Recife (now better known as Pernambuco), 23 January, 1637, and remained in Brazil seven years, returning to Holland with the Count in 1644. Marggraf went immediately to Africa, where he died, at St. Paul de Loanda, near the end of the same year, but Piso resumed his medical practice in Leyden, and afterward in Amsterdam, and edited and published the works of both himself and his friend, first in 1648, and again ten years later. These books were primarily medical, but included descriptions and figures of many Brazilian plants. Piso was evidently living when the second edition of his classical work was published, in 1658, but of his later history nothing is known; he was then more than sixty years old, and probably died soon afterward. J. H. B.

[4] Jean Baptiste Christophe Fusée Aublet was born 4 November, 1720, at Salon, in Provence (in the present-day department of Bouches du Rhone), France. He was interested in botany from early youth, collecting and studying all the plants of the vicinity of his home. At Montpellier he studied botany with François Boissier de Sauvages de la Croix (1706–1767), the valued correspondent of Linnaeus; at Lyon, with Christophle de Jussieu (1685–1758); and at Paris with his more famous brother, Bernard de Jussieu (1699–1777), from whom he received much aid in all his subsequent botanical work. In December, 1752, he was sent by the French government to Mauritius, to establish a pharmaceutical laboratory and botanic garden; there he remained for nine years, again arriving in France about the beginning of the year 1762. He sent many specimens of plants, as well as other natural objects, from Mauritius to France, but a part of them were lost on the way, and others dispersed upon the death before his return of friends to whom he had consigned them, and he never found any time to study those that remained. For, almost immediately upon his return to France, he was sent by the order of the king to French Guiana, to study the flora of the colony. He landed at Cayenne, 23 July, 1762, and remained almost exactly two years, devoting himself diligently to the task assigned him, collecting along the coast, about Cayenne and Kourou, and

that the coconut was introduced into Guiana by missionaries. Père Breton,[5] a French missionary in the Antilles, planted a coco nut in his garden and called it " palm," saying that it had no other name in the West Indies, for it was an introduced species. He had seen only two specimens of it growing. Hans Sloane[6] also

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penetrating a considerable distance into the interior along the Sinnamary River and its tributaries. Leaving Guiana late in July, 1764, he returned to France by way of northwestern Haiti, where he arrived on the 24th of August and was detained until the end of the year, in charge of military works. His health had suffered seriously from his stay in the tropics, and he could do little upon his arrival in France except search out what he could of the materials sent home by him during the preceding eleven years. He found his plant collections, especially those from French Guiana, the most complete and satisfactory for study and at last, in 1775, appeared his monumental work, the "Histoire des plantes de la Guiane Françoise," in four large quarto volumes, with numerous plates illustrating his finds. Three years later, 6 May, 1778, he died at Paris. His manuscripts and drawings, including many unpublished ones, passed into the hands of Sir Joseph Banks, and are now preserved in the herbarium of the British Museum of Natural History; duplicates of most of the plants were sent by Banks to the younger Linnaeus, and are now in the Smith herbarium, owned by the Linnean Society of London.—J. H. B.

[5] Raymond Breton was born in 1609 at Auxerre, France. In 1635 he went to the West Indies as a Dominican missionary, living among the Caribs and familiarizing himself with their language and customs, concerning which he published several books. He returned to France in 1643, and died at Caen in 1679.—J. H B.

[6] Hans Sloane was born 16 April, 1660, in a Scotch settlement at Killyleagh, County Down, Ireland. After studying chemistry and botany in London, he went to France in company with two friends and studied medicine at Paris and Montpellier, taking his medical degree at Orange, in 1683. Returning to London in 1684, he practiced his profession there for a few years, before starting on his famous West Indian voyage. It was 12 September, 1687, that he embarked at Portsmouth for Jamaica, as physician to Christopher, Duke of Albemarle, newly appointed governor of the island, and landed at Port Royal 19 December. On the way the party visited Madeira, Barbados, Nevis, and St. Kitts. Soon after their arrival in Jamaica the Duke died, but Sloane carried on his studies there for fifteen months, collecting altogether more than 800 species of plants. He left Port Royal 16 March, 1688/9, with the party of the Duchess of Albemarle, landing at Plymouth 29 May, 1689. In 1696 he published a preliminary catalogue of his plants; it was eleven years later (1707) that the first volume of his large illustrated work appeared, and eighteen more years before it was completed (1725) by the issue of a second volume. This large work was nominally an account of his voyage; actually it was

declared it to be an exotic in the West Indies. Hernandez,[7] who was sent on a mission to Mexico in 1575, speaks of the coconut as growing on the west coast of tropical Mexico; and instead of enumerating its uses in Mexico he speaks of its various applications in the Philippines. Dr. W. E. Safford saw it growing at Acapulco, Mexico, the port from which the early Spanish galleons sailed to the Philippines and to which they returned with Philippine products, none of which were easier to transport than coconuts. At this port the natives now slice off the tips of flowering branches and let the sap flow into receptacles through tubes of bamboo, exactly as is done in the Philippines. More than this,

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almost entirely devoted to the natural history, especially the botany, of Jamaica. For many years Sloane was one of the most famous physicians in London. He purchased the manor of Chelsea in 1712, was knighted in 1716, was physician to the king, and president of the Royal Society. At different times he acquired the greatest collections of natural history specimens in England—those of Petiver, of Plukenet, and of Courten and his library and collections became unique. He died at Chelsea, 11 January, 1752/3. He provided in his will that the British nation should be permitted to purchase all his books and specimens for £20,000; this parliament voted to do, and this was the nucleus of the British Museum of to-day. His herbarium was transferred to the Banksian Department in 1834, and is now at the Natural History Museum.—J. H. B.

[7] Francisco Hernandez was born in 1514, at Toledo, Spain. He graduated in medicine from the university in Salamanca, and became eventually physician at the Escorial and one of the advisers of King Philip II. This king sent him to "New Spain" (Mexico) to study and report upon its natural productions, placing at his disposal 60,000 ducats (about $138,000) for this purpose, and Hernandez started for America, well equipped, in 1570. He spent about five years collecting the plants, animals, minerals, and antiquities of the country and two years more studying, describing, and supervising the drawing of illustrations of them. When his work was completed, ready for the printer, it comprised sixteen folio volumes, six of text, and ten of plates. With these he returned to Spain in September, 1577, and they were deposited in the library of the Escorial, where they lay unpublished for nearly a century and were at length destroyed in the great fire that raged in that famous building for fifteen days in the year 1671. Duplicates of portions of his manuscripts he had left behind in Mexico, and some of his manuscripts and drawings, as well as his herbarium, found their way to Italy and France. These form the basis of the various books that have appeared bearing his name as author, but we can not gain from the fragments any clear idea of the excellence of his work. He survived his Mexican journey only about nine years, dying at Madrid, 28 January, 1587.—J. H. B.

"tuba," the name given to the fermented sap by the Mexicans, is the name used for it in the Philippines and in Guam.

Acosta,[8] in his Natural History of the Indies, 1590, says that he saw a coconut growing in Porto Rico; but he does not pretend to say that it was indigenous there. Indeed we know well that Columbus and his companions, who were quite eager to find East Indian products in the Antilles, did not observe the coconut growing there. On the other hand, throughout the islands of Polynesia the coconut is called "niu," a name identical with the "niug," or "niyog," of Guam and the Philippines. The Polynesian name can be traced, together with the nut, directly to the Malay Archipelago, the cradle of the Polynesian race, and to Madagascar, where it is called *wua-niu,* or "new fruit."

On the Polynesian Islands and in the Malay Archipelago there are a great many varieties known by distinct names, differing from one another in the forms of the nuts and in the uses to which they are applied. No such diversity of forms and uses is to be found in America, where indeed there is not a single distinctive name for the species. In pre Columbian times it was referred to by Marco Polo,[9] and by other travelers, not as *coconut*

[8] Joseph de Acosta was born in Medina del Campo, Spain, about 1539. He had been a Jesuit for twenty years when, in 1571, he was sent as a missionary to Peru. Here he remained for sixteen years, publishing, in 1583, the first book printed in Peru. He returned to Spain in 1587, and busied himself during the next few years with the preparation of several books, of which by far the best known is his "Historia natural y moral de las Indias" (1590). This was translated into six other languages within fifteen years, and was looked upon as one of the most important early works on the Andean region. In later years he lived at Valladolid, and at Salamanca, where he died 15 February, 1600.—J. H. B.

[9] Marco Polo, scion of a noble Venetian family and the most famous of mediaeval travelers, was born about 1254 and died in 1324, or possibly early the following year. His father, a merchant, had visited the court of China, and when he started on a second trip to that country, in 1271, he took the boy Marco with him. Parts of their itinerary passed through regions never again described by any European traveler for nearly six hundred years. They arrived at their destination in 1275—travel was slow in those days—and remained in China for seventeen years, accumulating much wealth and enjoying high favor with the Great Khan, Kublai, and his people. Reaching Venice in 1295, Polo resided there for the rest of his life. For a few months in 1298 and 1299, while a prisoner of war at Genoa, he dictated his experiences to an enthusiastic literary friend, and

but as *nux indica,* a fact to which many authors who have discussed the coconut do not refer. The argument that *Cocos nucifera* must be American because the palms most closely related to it are American, is shown by Beccari to be incorrect. This eminent authority shows that *Cocos nucifera* is to be regarded as monotypic, more closely related to *Jubaeopsis caffra,* of southern Africa, than to any of the so-called Cocos species of South America, all of which he has separated from the genus Cocos into other genera; and one of the most convincing arguments of all is the fact that the robber crab, *Birgus Latro,* which is especially adapted for feeding upon the coconut, is associated with it nearly throughout its range in the Pacific, while it is quite absent from America.

As will be seen, most of our Florida coconut trees are results of comparatively recent plantings and those that have sprung up from fruits produced by these.

Having been cultivated for so many ages and in such diverse environments, it thrives almost anywhere in the state where the temperature does not fall too low. Thus wet or dry situations, fresh or salt, sand or rock, all harbor it.

All of our palms have been used, locally at least, in domestic economy, in the trades, and in horticulture, but the coconut is the economic palm, *par excellence,* in Polynesia and the Malay Archipelago. In America the coconut palm is used as a source of oil and to some extent as food; and in southern Florida the plant is extensively and effectively used in horticulture. Not only are its products used locally, but they are shipped in great quantities to distant parts of the cooler zones of the world.

Its prominence in Florida is divided into two periods:

Earlier Planting and Cultivation in Florida

The earlier history of the cultivation of the coconut in Florida is contained in the following paragraphs from a letter received from Commodore Ralph Middleton Munroe, who was one of the early settlers in the Bay of Biscayne region of the state:

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thus was preserved the book that contains the earliest detailed account of the countries of central, eastern, and southeastern Asia, and the Malay Archipelago. For several hundred years Polo's stories were regarded as more or less mythical, but modern exploration has confirmed his reputation for veracity.—J. H. B.

"My first acquaintance with the coconut palm in Florida was at Key West during August, 1877, when it was growing luxuriantly in most of the door yards and in quite a grove near the water just south of the present Custom House and old Naval Depot. It is to be presumed that these were planted from nuts procured in Cuba and Roatan, and although many trees were growing along the key shores as far north as Cape Florida, that evidently floated there from the shores of the Caribbean Sea, it can harly be claimed that they were indigenous any more so than in other parts of the West Indies.

"As I sailed easterly from Key West bound for Bay Biscayne, the first notable grove of these palms, very evidenly planted, was at Boca Chica Key and my impression is that a Dr. Baird or Bayer who had a small plantation of fiber-bearing plants there was responsible for the coconut trees. At Sugar Loaf Key was another plantation apparently of larger extent from which I understood there was some financial profit. The owner's name of this grove I have also lost. No more coconuts were to be seen until reaching Long Key except a few scattering ones on Key Vaca and Bamboo Key. Messrs. Fogarty and Johnson, of Key West, had planted, about this time or a year later, 10,000 nuts on Long Key. The Messrs. Hine, of Newark, New Jersey, who came out with me in the fall of 1884 to Coconut Grove, purchased this Fogarty and Johnson grove the following year and until about 1890 continued to plant coconuts until some 20,000 palms in all were in the process of growth. In January, 1886, I was on this Key when the thermometer dropped to 36 degrees. To the best of my knowledge no financial profits ever resulted from this planting.

"Passing from Long Key up to Cape Florida we noticed Lower Matacumba Key, Upper Matacumba Key, at the Russell plantation were quite a number of coconuts, and Indian Key once well covered with them; on Plantation Key, Key Largo, and Elliott's Key, they were to be found at every pineapple plantation landing place, especially at Pindar and at Johnsons at Elliott's Key, where there was at least a half mile of beach ridge planted with the trees. Cape Florida, in the early days, had a pretty clump around the lightkeeper's dwelling. These were quite old trees and as there were none visible on the beaches north of this point, until later years, passengers on passing vessels were always called upon to take their first look at the tropics and their vegetation.

"The Miami River mouth was fringed with a beautiful growth, some of the trees possibly dating back to the early fifties, and a beautiful grove, one of the earliest planted on the mainland, is on the reservation of Charles Deering at Buena Vista just north of Miami. At Coconut Grove there was a small plantation, but the gale of 1876, previous to my arrival, had destroyed all but two

FIGURE 1. The Hine Villa on Long Key in 1885. This was the headquarters of the Hine Brothers (see page 158) during

specimens. This same gale wrecked a vessel loaded with the nuts close to Lake Worth, and the 'Western Colony' there, at what is now known as Palm Beach, took advantage of this disaster, secured the coconuts, and planted miles of their beach bluff with them.

"During the winter of 1881 and 1882, men named Lum and Grover came from Red Bank, New Jersey, prospecting for coconut land, and after making selections on the beach opposite Miami departed to return the following winter, which they did, or at least Lum did, and several years were spent by him and his son in making considerable of a plantation. I am unaware of any financial profit resulting from this transaction until Miami Beach came into being, when the Lums got fabulous prices for the land and still own some of it. Twenty-five cents, seventy-five cents, and $1.25 per acre was about the original cost of the land.

"During the winter of 1882 and 1883, more New Jersey men got the 'fever.' Messrs. Field and Osborn, of Middletown, New Jersey, more or less wealthy folks, starting in with a very complete outfit of men and material, began work on Key Biscayne and within a few years had planted most of the available land back of the beaches northward up to Boca Ratone for the distance of some forty miles. The nuts they planted came mostly from the Island of Trinidad, West Indies, and were landed in Seabright-built surf-skiffs handled by ex-lifesaving men. About 316,000 nuts were planted, but the ravages of rats and rabbits, combined with poor soil in places, finally made a failure of the coconut business, but the remaining trees so enhanced the value of the land that much was gotten back from the investment indirectly after all.

"In Key West the 'fever' broke out again, about 1885 or before, and the Waddell brothers bought and planted Cape Sable, using 1,120 acres and 38,000 coconuts. I believe the land at the Cape was better than much of the other then in use, but cold weather in all cases, coupled with poor land, was the main cause of failure, in my estimation.

"I studied the subject from my first contact with it and refused to participate in the development of any of the plantations.

"The most northern coconut tree that I am aware of once stood at Jupiter, but the 'freeze' of 1894, and that of 1895 killed it. There is a legend of one once standing at Fort Capron (opposite Indian River Inlet). Captain Horr, I believe, planted a grove at Caxambas about 1889 or latter."[40]

(To be continued.)

J. K. SMALL.

[10] This grove is still flourishing.

BOTANY IN RELATION TO GEOLOGY[1]

Whether botany is discussed in connection with its relation to geology, or geology in connection with its relation to botany, is of little moment, because the two are so closely interwoven in many instances. The object of this lecture is to present and discuss examples of certain of the many ways in which vegetation influences geological conditions and phenomena, and certain of the many ways in which geological conditions and phenomena influence vegetation. Such examples are so numerous and varied that, in the limited time available, only a few of the more interesting and important can be presented, and these few will have to be discussed more or less briefly.

Perhaps the most important of the interrelations between botany and geology is the relation between vegetation and soil. Soil is any more or less finely divided, incoherent mineral matter, or disintegrated rock, generally with a relatively small admixture of decayed organic matter, either animal or vegetable. Everything that we recognize as soil began as solid rock, except for any organic matter that may be present.

Rock is disintegrated and converted into soil through the action of various agencies. Heat and cold, wind and water, etc., each plays its part, and so does vegetation. Incidentally it may here be remarked that both geologists and botanists have always been interested in attempting to determine and to visualize what the first forms of plant life were like. We have every reason to believe that during a long period of time in its infancy, our earth was nothing but a wilderness of bare rocks and heated waters, absolutely devoid of any form of life. Plant life must have preceded animal life, inasmuch as the latter is dependent, directly or indirectly, on the former. Marine algae or seaweeds and their freshwater relatives were probably in existence long before terrestrial conditions were such that any kind of land vegetation was possible. What then may be inferred in regard to the kind of vegetation that was the first to gain a foothold on the bare and barren rock surface of the primeval earth?

If almost any exposed rock surface is examined at the present time it may be seen to support, over more or less of its surface,

[1] Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, April 13, 1929.

individual plants, or considerable aggregations, of lichens or, more or less microscopic aerial algae, their probable predecessors. These represent the only types of plant life that are able to exist, without protection, under the extremes of heat and cold, aridity and moisture, etc., to which the exposed rock surface is subjected. This, then, is what may be assumed to have been the first type of terrestrial vegetation; and this assumption is further strengthened by the biological characters of the lichens, which are in part algoid, or related to the seaweeds, and in part fungoid, or related to the fungi—a combination of the two lowest types of plant life in regard to which we have any knowledge.

Lichens having once secured a foothold on any rock surface immediately send their tiny rootlets into every inequality, every little crack or crevice, and the process of rock disintegration immediately begins. The growing roots exert a mechanical action, and the decayed parts of the plants exert a chemical action through the medium of the organic acids that are thus produced. Soil formation has begun, as may be seen by lifting a lichen from the rock on which it is growing and noting the dark powder or film beneath. If any crack or crevice is at hand this may harbor an accumulation of soil sufficient for other, higher forms of plant life to become established there—mosses, ferns, then herbaceous and woody plants; and as root systems grow stronger the crevice is slowly enlarged by constantly increasing root expansion. The rock is fractured. Rain and frost gain access, and rock disintegration and soil formation is slowly but surely accelerated.

Vegetation may also be studied in connection with its influence upon topography or the geologic features of the earth's surface. A pond may be considered as an example. If aquatic and semi-aquatic vegetation grow undisturbed there for a considerable period the decayed plant débris, and such other material as may be blown in by wind or washed in by rain, will cause the water to become shallower and more restricted in area, until ultimately the pond may be entirely obliterated and a new topographic feature a swamp—may take its place. Most swamps have originated in this way, through the effects of growing vegetation.

The topography of a region may also be modified or radically changed if the vegetation, that serves as a protecting mantle to the soil, is destroyed or disturbed. Abandoned tracts of land that

were formerly cultivated, especially if they are located on slopes or hillsides, are always subject to gullying, especially if the plowing was done up and down, in the direction of the surface slope, instead of across or around it. The furrows serve as channels for rain water. The effects of erosion become more and more pronounced, and eventually a tract of land that originally presented a level or rounded surface is transformed into one that consists of a series of ridges and small valleys.

Geological conditions in connection with originally barren or denuded land areas may be greatly influenced by subsequent growth of vegetation, either natural or introduced through the agency of man. The so-called Landes of France is an example. Hundreds of miles of bare, shifting sand dunes were converted into stable, productive forest land, by planting them with pine trees and encouraging a natural undergrowth to establish itself. In America we have a similar example in connection with the dune region in the vicinity of Provincetown, on Cape Cod. These dunes were originally well forested and represented what might have remained a permanent topographic feature of the region. In Bradford's narrative of the landing of the Pilgrims there, in 1620, he says: " On this side where we lay is the bay, and on the further side the sea; the ground or earth, sand hills, much like the Downes in Holland, but much better; the crust of the earth, a spit's depth, excellent black earth; all wooded with oaks, pines, sassafras, juniper, birch, holly, vines, some ash, walnut; the wood for the most part open and without underwood; fit either to go or ride in." The trees were cut down, however, and since then a ceaseless warfare has been waged to prevent the drifting sand of the denuded dunes from overwhelming the town and harbor of Provincetown. In the preamble to Chapter 3, of the Acts of 1714, may be found the following pronouncement: " Whereas, the Harbor of Cape Cod, being very useful and commodious for fishing, and the safety of shipping, both inward and outward bound, is in danger of being damnified, if not made wholly unserviceable, by destroying the trees standing on said Cape (if not timely prevented), the trees and bushes being of great service to keep the sand from being driven into the Harbor by the wind . . . etc." And in 1740 an act was passed " to prevent damage being done to the Harbor of Cape Cod by cattle and horse-kind feeding on Provincetown land."

During recent years the State of Massachusetts has conducted extensive experiments in reforesting the dunes, beginning by planting bunches of beach grass (*Ammophila arenaria*), then bushes of bayberry (*Myrica carolinensis*) in among the patches of grass; covering any large bare places with brush wood, and finally planting small trees of *Pinus rigida* wherever the growth of grass and bayberry offered sufficient protection. This method of planting has, apparently, been successful in starting a new forest growth and in obviating further danger from drifting sand.

Underground geological conditions may often be seen to influence the vegetation growing on the adjacent surface to a marked extent. In the State of New Jersey, for example, there are three well-defined zones of vegetation that extend across the state in a northeast-southwest direction. The northern zone is represented by a prevailingly deciduous vegetation; the southern by a prevailingly coniferous; and the intermediate or tension zone by a vegetation that is a mixture of the two types of vegetation that lie one to the north and the other to the south. If a geological map of New Jersey is examined, it will be seen that the deciduous zone occupies a territory in which the geological outcrops are largely Triassic diabase, sandstone and shale, and older metamorphic rocks, the disintegration of which provides a constant supply of plant food and can thus support the higher, deciduous, forms of plant life. The coniferous zone, on the other hand, includes a territory where Tertiary quartz sands and gravels largely prevail, which, even when further disintegration ensues, can supply but little plant food, and only lower forms of plant life, or stunted representatives of higher forms, can maintain an existence there. This is the region of scrub oak and pine barrens. The intermediate or tension zone comprises the territory where the Cretaceous clays, clay marls, and marls are the underlying and outcropping strata. These strata provide soils that are intermediate in character between that of the deciduous and that of the coniferous zone, and the vegetation is a mixture of the two, which is in a condition of tension sometimes one of the types gaining an advantage, and sometimes the other.

The more violent phenomena of geology, such as earthquakes and volcanoes, frequently destroy extensive areas of vegetation, as was the case in connection with Krakatoa in the Malay Archi-

pelago, La Soufrière in Saint Vincent, Mt. Pelee in Martinique, and Mt. Katmai in Alaska. Over hundreds of square miles in the vicinity of these loci of volcanic activity the vegetation was either totally or partially destroyed by lava, pumice, and ashes. Such effects are more obvious and spectacular than are those that are produced by the forces that are in action around us all the time —heat and cold, wind and water, rain and frost, growing and decaying vegetation, etc. but these latter forces produce more far-reaching effects, for the reason that they are actively at work everywhere, ceaselessly, both by night and by day.

The lecture was illustrated by lantern slides of bare rock exposures, sand dunes, ponds, swamps, etc., each with its characteristic vegetation; denuded areas, showing the effects of gullying by rain; regions devastated by volcanic activity; maps and diagrams depicting geologic and topographic features, etc.

ARTHUR HOLLICK.

A COLLECTION OF PLANTS FROM MOUNT DUIDA

The great river Orinoco rises in the mountains which form the boundary between Brazil and Venezuela, but lies wholly within the latter country. Its course extends first to the west, then to the north, and finally eastward to its mouth in the Atlantic Ocean just south of Trinidad. During its upper, or westward, course it branches, the main channel continuing as the Orinoco and the minor channel turning southwest to join the Rio Negro, a tributary of the Amazon. This minor branch, the Casiquiare Canal, connects two enormous river systems and affords a navigable highway extending through the heart of South America from the mouth of the Amazon to the mouth of the Orinoco. At the point of bifurcation of the Orinoco into the Orinoco proper and the Casiquiare once stood the village of Esmeralda, and a few miles to the north rises the famous Mount Duida.

Alexander von Humboldt was the first scientist to see Duida. On May 21, 1800, he entered the Orinoco from the Casiquiare and spent several days at Esmeralda. "The granitic summit of Duida," he wrote, "rises in an amphitheater on the right bank of the river. This mountain, which the missionaries call a volcano,

is nearly eight thousand feet high. It is perpendicular on the south and west, and has an aspect of solemn grandeur. . . . The granitic summit of Duida is so nearly perpendicular that the Indians have vainly attempted its ascent."

From that day until the present year Duida has remained impregnable. More than one scientific expedition has passed by it, or has attempted its ascent, but all have failed, until the Tyler-Duida Expedition from the American Museum of Natural History at last conquered its vertical escarpments, remained several weeks on the broad summit, and returned with a rich collection of zoological and botanical specimens. The latter, amounting to about a thousand numbers, and including almost as many species, has been presented to The New York Botanical Garden, and constitutes the only botanical material extant from this remarkable region. The botanical collections were made by Mr. G. H. H. Tate, who had successfully ascended Mount Roraima only a year before.

Pending the careful study of the collection, it is impossible to state what the full extent of its value may be, and we can only make some comparative statements based on the somewhat similar flora of Mount Roraima. Duida and Roraima stand at the westernmost and easternmost ends of the Parima Range and are about four hundred miles apart. What lies between them is largely unknown and is completely unknown botanically. The summit of Roraima is noted for its endemism. Nine tenths of the species of plants which exist on the summit of Roraima are known from that mountain only. They are alpine or subalpine species, demanding for their existence the low temperatures and heavy rainfall of high altitudes. The whole range is surrounded on every side by broad lowlands occupied by dense Amazonian forests or broad savannas, which offer an impassable barrier to montane plants. Yet the flora of Roraima shows distinct affinities with that of the Andes on the one hand and with that of the Organ Mountains of southern Brazil on the other. How, when, and by what route did these species of Roraima reach the mountain? At present we can only speculate on the answer, but we believe that a study of the flora of Duida will throw considerable light on the subject, and now, for the first time, such a study is possible. Preliminary examination of the collection has already

shown several species of the Roraima region, indicating that the peculiar flora of Roraima is not strictly endemic, but is shared by Duida and presumably by other high intervening mountains, and has also revealed that Duida has many endemic species of its own, as yet completely unknown to science. The detailed study of the collection will constitute a contribution of the highest importance to our knowledge of the flora and plant geography of northern South America.

H. A. GLEASON.

DR. RUSBY TO RECEIVE HANBURY MEDAL

Dr. Henry Hurd Rusby, Honorary Curator of the Economic Collections, has been awarded the Hanbury Medal for the year 1929.

The Daniel Hanbury gold medal is a periodical award by the British Pharmaceutical Society for outstanding accomplishment in the field of pharmacognosy and phytochemistry. The Hanbury award is the most cherished in international pharmacy and only twice before since its inception in 1881 has the award gone to an American.

Henry Hurd Rusby, Dean of the New York College of Pharmacy of Columbia University and Professor of Materia Medica and Botany, is perhaps the most honored of American pharmacists. He has been president of the American Pharmaceutical Association and of the American Conference of Pharmacy Faculties. He has been a member of three revision committees of the United States Pharmacopoeia and of the Revision Committee of the National Formulary. In 1905, he was editor of the National Dispensatory. He is also the author of many other books.

His explorations in Colombia, Bolivia, Venezuela, and Brazil in the interest of medical botany are a part of his inspiring record of achievement. He has introduced into American materia medica many important drugs discovered by him in South America.

Dr. Rusby in 1923 was the recipient of the highest award in American pharmacy, the Remington Medal. The Hanbury award is particularly fitting and appropriate, coming as it does at the

time when the college of which he is Dean is celebrating its one hundredth anniversary. Dr. Rusby has served forty-one years on its faculty.

Dr. and Mrs. Rusby will leave in September for England for the conferring of the award.

WILLIAM J. BONISTEEL.

CANADA GEESE IN THE BOTANICAL GARDEN

Five years ago a pair of Canada Geese (*Branta canadensis*) came from the New York Zoological Park and built a rough nest on a little island in the Botanical Garden in the wild portion of one of the three ponds that drain into the Bronx River. That year, the first time that they tried it, there was a very wet spring and the nest was flooded, the second year the eggs were stolen, and the third year one of the old birds was killed. Last year they were watched and guarded by the regular watchman in charge of

FIGURE 2. Canada geese nesting in the Botanical Garden, May, 1928.

that section of the Garden and they succeeded in hatching out five of the eggs, of which brood three goslings are reported to have returned to the Zoo. The tale is told, that the mother goose and three little goslings held up the traffic on the Pelham Parkway, while they deliberately waddled across, a negro chauffeur heading the line of waiting automobiles and grinning from ear to ear. This amount of consideration is not often given to any wild animals, for squirrels and toads are often found crushed on the main avenues of traffic in The New York Botanical Garden.

FIGURE 3. Canada geese feeding from the hand in the Botanical Garden, May, 1929.

This year the same pair tried to nest again in the same place as last year, and again the eggs were stolen. Meanwhile they have become so tame that they will readily feed from the hand. Many members of the staff feed these geese, and often as many as fourteen of the birds may be found swimming around in the upper lake near the shelter house; but the original pair resent the intrusion of any outsiders and claim the right to be hand-fed, chasing

the others away if they venture too near. Some of these others may have been born here at the Garden, for it is a well-known fact that birds return to the places where they have previously nested. It is not unusual to see them flying about and hear them honking. There are so many of them now at the New York Zoological Park that they are not clipping their wings, thus giving the benighted " speed-maniacs " who dash through the gardens mornings and evenings, a chance to see and hear some of the wild denizens who still have the courage to live here.

But it is evident that if we are to keep any of the native animals and plants, it will be necessary to do what has been done at " The Yale Natural Preserve " at New Haven. Here a " selected tract of about twelve acres has been surrounded by a high wire-mesh fence and designated as a wild plant and bird sanctuary. The area includes a swamp and a small stream which has been dammed up to form a pond. . It includes a variety of habitats, and already a large number of rare or otherwise interesting plants have been set out here—plants such as the showy lady's-slipper and trailing arbutus, which it is desired to have accessible but which cannot be successfully grown at the Garden. Considerable areas within the sanctuary have been cleared of weeds and planted to berry-producing shrubs or small trees of recognized food value to birds. A small portable house has also been erected here to serve as a workshop and general headquarters for the custodian."[1] .

ELIZABETH G. BRITTON.

PUBLIC LECTURES DURING JULY AND AUGUST

The following is the program of the free illustrated lectures given at The New York Botanical Garden during July and August. These lectures are in the Museum Building on Saturday afternoons, beginning at four o'clock. Doors are opened at 4:15 to admit late-comers.

July 6. "Lilies," Dr. A. B. Stout, Director of Laboratories.

July 13. " Asiatic Beetles,"
Mr. L. O. Hallock, United States Department of Agriculture.

[1] Quotation taken from a reprint from *The Yale Scientific Magazine*

July 20. "What Modern Science is Trying to Do,"
Dr. Otis W. Caldwell, Director of Institute o
School Experimentation.
July 27. "Sowing and Planting for Next Year's Flowers,'
Mr. Kenneth R. Boynton, Head Gardener.
August 3. "Our Native Trees,"
Dr. Forman T. McLean, Supervisor of Publi
Education.
August 10. "Diseases of Plants and How They Spread,"
Dr. B. O. Dodge, Plant Pathologist
August 17. "Pollen Grains and Hay Fever,"
Dr. R. P. Wodehouse, Arlington Chemica
Company.
August 24. "Fossil Forests of Arizona,"
Dr. Arthur Hollick, Paleobotanist
August 31. "Czecho-Slovakia," Dr. H. A. Gleason, Curator

NOTES, NEWS, AND COMMENT

Dr. P. A. Rydberg, Curator, left New York on June 13 to devote about three months to botanical field-work in Kansas and Minnesota.

Special days for inspecting the floral displays of The New York Botanical Garden have been observed as follows: April 18, Daffodils (Narcissi); May 9, Late Tulips and Rock Garden; June 6 Iris and Peonies; and June 22, Roses.

Bulletin of The New York Botanical Garden, No. 50, including annual reports for 1928 of the Secretary and Director-in-Chief the Treasurer, and various members of the scientific and administrative staff, was issued on May 31.

The recently published third volume of "A Bibliography of American Natural History: The Pioneer Century, 1769–1865,' by Max Meisel, formerly of the Science Division of the New York Public Library, is dedicated to Dr. John Hendley Barnhart, Bibliographer of The New York Botanical Garden. The large-octavo

volume comprises 749 pages; it was printed by the Science Press Printing Company, of Lancaster, Pa., and The Premier Publishing Co., 658 Broadway, Brooklyn, is given as the publisher.

Dr. G. H. Cunningham, of the Plant Research Station, New Zealand, recently spent a few days at The New York Botanical Garden looking over the institution and especially the fungus collections. Dr. Cunningham has been one of the most active mycologists in his section of the world and has frequently sent collections of valuable fungi for determination and incorporation in the herbarium of The New York Botanical Garden. Dr. and Mrs. Cunningham were on their way to Europe where they expect to spend some time in herbaria.

The following visiting botanists registered in the library during the spring months:

Profs. H. H. Whetzel and H. M. Fitzpatrick and Mr. S. H. Burnham, Ithaca, N. Y.; Prof. John W. Harshberger and members of the Botanical Society of Pennsylvania, the Geographical Society of Philadelphia and the Philadelphia Women's City Club; Messrs. Thomas H. Kearney and Perkins Coville, Washington, D. C.; Mr. and Mrs. M. E. Peck, Salem, Ore.; Prof. D. H. Campbell, Stanford University, Calif.; Prof. G. R. Bisby, Winnipeg, Can.; Dr. Ethel M. Poulton, University of Birmingham, Eng.; Prof. Yukio Yamada, Sapporo, Japan, and Prof. Takashi Naito, Imperial College of Agriculture and Forestry, Kagoshima, Japan.

Meteorology for May. The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: 68½° on the 2nd; 84° on the 12th; 85° on the 15th; 80° on the 25th; and *89° on the 31st.* The mimimum temperatures recorded were *39° on the 4th;* 41° on the 17th; 40° on the 21st; and 44° on the 27th. The total precipitation for the month was 3.15 inches.

Meteorology for June. The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: 94° on the 1st; 86° on the 7th; 92° on the 16th; *98° on the 19th;* and 86° on the 24th. The minimum temperatures were: 61° on the 2nd; *46° on the 9th;* 50° on the 11th; 62° on the 21st; and 55° on the 29th. The total precipitation for the month was 1.13 inches.

ACCESSIONS

LIBRARY ACCESSIONS FROM MARCH 1 TO MAY 31

ASAMI, YOSHICHI. *The crab-apples and nectarines of Japan; contribution of the systematic investigation of fruit-trees cultivated in Japan* Tokyo, 1927. (Given by Marquis Naomitsu Nabeshina.)

BAILEY, IRVING WIDMER, & SPOEHR, HERMAN AUGUSTUS. *The role o, research in the development of forestry in North America.* New York, 1929. (Given by Dr. N. L. Britton.)

BLANKAART, STEPHEN. *Lexicon novum medicum graeco-latinum.* Lugduni Batavorum, 1701.

BLATTER, ETHELBERT. *Beautiful flowers of Kashmir.* 2 vols. London 1928–29.

BLOSSFELDT, KARL. *Urforme der Kunst: photographische Pflanzenbilde . . . herausgegeben mit einer Einleitung von Karl Nierendorf.* Berlin, [1928]. (Given by Dr. J. H. Barnhart.)

BOBART, JACOB. *Catalogus plantarum Horti medici oxoniensis.* Oxonii 1648.

COVENTRY, BERNARD OKES. *Wild flowers of Kashmir.* Series I. London [1924].

FILHOL, JEAN PIERRE ÉDOUARD BERNARD, JEANBERNAT, ERNEST JULES MARIE, & TIMBAL-LAGRAVE, PIERRE MARGUERITE ÉDOUARD. *Exploration scientifique du massif d' Arbas (Haute Garonne).* Toulouse 1875.

FOURCY, EUGÈNE DE. *Vade-mecum des herborisations parisiennes.* Ed. 3 comprenant les mousses et les champignons. Paris, 1872.

FRYER, ALFRED, & BENNETT, ARTHUR. *The Potamogetons (pond weeds of the British Isles . . . illustrated by Robert Morgan & others* London, 1915.

GWYNNE-VAUGHAN, HELEN CHARLOTTE ISABELLE (FRASER), & BARNES BERTIE FRANK *The structure & development of the fungi.* Cambridge, 1927.

HAUSER, FRITZ. *Die Alpenflora, 130 Abbildungen in Farbenkunstdruc mit besondere Berücksichtigung der Ostalpen nach der Natu gemalt herausgegeben.* . von C. J. Oehninger. Ed. 2. Graz 1908.

HAWKES, ELLISON, & BOULGER, GEORGE SIMONDS. *Pioneers of plant study* London, 1928.

HEATHCOTE, EVELYN DAWSONNE *Flowers of the Engadine, drawn from nature.* Winchester, 1891.

HODGSON, WILLIAM. *Flora of Cumberland . . with an introductor chapter on the soils of Cumberland by J G Goodchild.* Carlisle, 189[8]

HULME, J. R. *The Scarborough algae.* Scarborough, 1842.

JEANBERNAT, ERNEST JULES MARIE, & TIMBAL-LAGRAVE, PIERRE MARGUERIT ÉDOUARD. *Le Capsir, canton de Montlouis.* Paris, 1887.

KIRK, JOHN WILLIAM CARNEGIE. *A British garden flora.* London, 192[7]

KNUTH-KNUTHENBERG, FREDERIK MARCUS. *Kaktusbogen.* Kjøbenhavn, 1928. (Given by the author.)

LEMÉE, ALBERT MARIE VICTOR. *Dictionnaire descriptif et synonymique des genres de plantes phanérogames.* Vol. 1. Brest, 1929. (Given by the author.)

MCKELVEY, SUSAN DELANO. *The lilac; a monograph.* New York, 1928. (Given by the author.)

MANSEL-PLEYDELL, JOHN CLAVELL. *Flora of Dorsetshire* London, 1874.

MARTIN-SANS, E. *L'empoisonnement par les champignons et particulièrement les intoxications dues aux Agaricacées du groupe des Clitocybe et du groupe des Cortinarius.* Paris, 1929.

MASON, WILLIAM A. *A history of the art of writing.* New York, 1920. (Given by Mrs. N. L. Britton.)

MATTIOLI, PIER' ANDREA. *Commentarii in sex libros Pedacii Dioscoridis Anazarbei de medica materia.* Venetiis, 1565.

MOLL, JAN WILLEM, & JANSSONIUS, HENDRIK HAYO. *Botanical pen-portraits.* The Hague, 1923.

PERRIN, I. S. *British flowering plants . . . three hundred full-page coloured plates . . . with detailed descriptive notes and an introduction by Professor Boulger.* 4 vols. London, 1914.

Proceedings of the International congress of plant sciences, Ithaca, New York, August 16–23, 1926. Vol. 1. Menasha, 1929.

RAO, M. RAMA. *Flowering plants of Travancore.* Trivandrum, 1914.

SORAUER, PAUL CARL MORITZ. *Handbuch der Pflanzenkrankheiten.* Vol. 1. *Die nicht parasitären Krankheiten.* Ed. 5, neu bearbeitet von Paul Graebner. Berlin, 1924.

STEPHENS, PHILIP, & BROWNE, WILLIAM. *Catalogus Horti botanici oxoniensis . . . in consilium D. Boberto patre, Hortulano academico ejusque filio.* Oxonii, 1658.

WEST, GEORGE STEPHEN. *A treatise on the British freshwater algae . .* new & revised edition in great part rewritten by F. E. Fritsch. Cambridge, 1927.

WHELDON, JAMES ALFRED, & WILSON, ALBERT. *The flora of West Lancashire; that portion of the country north of the river Dibble and south of Morecambe bay.* Liverpool, 1907.

Plants and Seeds

630 plants for Rock Garden. (Purchased.)
6 plants for Rock Garden. (Given by W. A. Toole.)
8 plants for Phlox and Aster Border. (Given by W. A. Toole.)
39 plants for Phlox and Aster Border. (Given by Gray and Cole.)
10 plants for Iris Garden. (Given by Clair A. Brown.)
1 clump of Viola. (Given by Clair A. Brown.)
5 plants of Iris. (Collected by W. M. Buswell.)
19 plants of Iris. (Purchased.)
425 plants derived from seed.
54 plants derived from spores.
2 packets of seed. (Given by Dr. H. H. Rusby.)
1 packet of Magnolia seed. (Given by Geo. Friedhof.)
1 packet of Ilex seed. (Given by John G. Borin.)
1 packet of Binghamia seed. (In exchange with Otto Degener.)
1 packet of Ipomoea seed. (In exchange with Mr. Arthur Fairchild.)
1 packet of seed. (Given by R. S. Hendrix.)
1 packet of seed. (In exchange with C. D. Mell.)
2 packets of Iris seed. (In exchange through Ynes Mexia.)
1 packet or Iris seed. (From Dykes Plants.)
355 packets of seed. (In exchange with Royal Botanic Garden, Kew.)
1 packet of *Marsdenia fusca* seed. (Collected by J. G. Jack.)
1 packet of Dahlia seed. (Given by F. MacCoy.)
9 packets of seed. (Exchange with Robert Runyon.)
1 packet of seed. (Collected by Dr. J. K. Small.)
98 packets of seed. (Exchange with B. G. De Lausanne.)
90 packets of seed. (Exchange with Brooklyn Botanic Garden.)
72 packets of flower seed. (Purchased.)
567 packets of seed for Rock Garden. (Purchased from Thompson & Morgan.)
2 packets of Cymbalaria seed. (Given by Miss R. Weikert.)
9 packets of seed. (Given by Continental Rubber Co.)
3 packets of seed. (Given by Mrs. P. Jantzen.)
4 packets of seed. (In exchange with Dr. C. E. Moore.)
1 packet of Hibiscus seed. (Given by Prof. William J. Bonisteel.)
61 packets of seed. (In exchange with Botanic Garden La Mortola.)
1 packet of Magnolia seed. (Given by J. Warren Smith.)
1 packet of seed. (Given by Dr. W. H. Ballou.)

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GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of narcissi, daffodils, tulips, irises, peonies, roses, lilies, water-lilies, gladioli, dahlias, and chrysanthemums; in the winter displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than one million specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 38,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural, and forestal subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK CITY

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JOURNAL
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THE BULB- OR STEM-NEMATODE (TYLENCHUS DIPSACI KÜHN) AS A PEST OF PHLOX

Tylenchus dipsaci, the well-known nematode pest of narcissus, onions, potatoes, alfalfa, clover, strawberries, oats, rye, and other plants, has in recent years attracted the attention of plant pathologists as a serious pest of phlox. Early observations of this kind were made by Nypels (2) and by Ritzema Bos (7) in 1899 in Belgium and Holland. Later it was observed by Osterwalder (3) in Switzerland and by Schwartz (9) in Germany. Lately notes about this pest have been more frequent in Central Europe [Pape (4), Landgraf (1)].

In the United States, the first observation of phlox disease caused by these minute worms was made in 1923 by Harry B. Weiss in New Jersey (10). In 1928 some phlox plants with the present disease were sent from Connecticut to the U. S. Department of Agriculture for examination. During the first half of 1929 its presence in Moorestown, N. J., in Mountain Lakes, N. J., in The New York Botanical Garden, and in Westport, Conn., was established, in each case involving from fifty to several hundred plants.

The disease is very destructive to phlox and needs the surveillance of plant pathologists, especially in view of the quarantine restrictions placed on bulbs, alfalfa, and clover seeds, when infested with this same organism. Harry B. Weiss expresses the opinion that the disease was introduced from Europe through imported narcissus bulbs. There is, however, at present no experimental proof that this disease agent, *Tylenchus dipsaci,* can be transferred from narcissus to phlox; but, in view of our present knowledge, the possibility of such a transfer can not be denied.

Nothing is known about the transfer possibilities from phlox to other host plants. Nypels noticed various hybrid phlox varieties attacked to a similar degree. A variety called "Vierge Marie" seemed to him somewhat more resistant. *Phlox paniculata* was also found to be infested, but Nypels remarks that this species has also contributed to the production of the hybrid phlox varieties. The same investigator also examined *Phlox verna, Phlox setacea* (?), and *Phlox Drummondii* growing adjacent to the infested area, but noticed no signs of the disease. He even tried to infest *Phlox Drummondii* plants, but without success. However, this species was subsequently found infested in Holland by Ritzema Bos. In view of the observations by Quanjer (5, 6), who established definitely the possibility of the transfer of a potato population of *Tylenchus dipsaci* to a large number of various other host plants, careful consideration should be given to such new findings as those here recorded. In amplification, it may be added that last year the first oats and the first bulbous iris harboring this pest were found in this country.

The seriousness of the disease, not only for phlox but for other ornamentals and for certain very important crops, can not be questioned. Many specimens in a planting of a number of varieties of phlox in The New York Botanical Garden died in the past two or three years. A cane-borer (*Papaipema nitela* Guen.) was seen at work in the plantings and was undoubtedly the cause of the death of many stalks. Mites (*Rhizoglyphus hyacinthi* Boisd. and *R. phylloxerae* Riley) were also observed, but their significance as a disease agent is not known. Various fungi also were isolated from dying plants. Miss E. A. Fenner, of the Bureau of Plant Industry, United States Department of Agriculture, Washington, D. C., is now at work on this phase of the disease. She first observed nematodes in diseased plants and brought them to the attention of the nematologists in the Bureau of Plant Industry, who identified them as *Tylenchus dipsaci.*

As shown in the accompanying illustrations, the symptoms produced by this nematode on phlox are very characteristic, especially in the more advanced stages. The disease can readily be diagnosed. Young stalks which first appear to be growing normally will, if diseased, show a swelling an inch or two long just

FIGURE 1. Phlox plants with abnormal swellings on the stems and crinkled and reduced leaves, as caused by *Tylenchus dipsaci*, the bulb- or stem-nematode.

below the tip, which is crowned with a loose or elongated rosette of half a dozen or more leaves. Usually the stalk is slightly bent sidewise at the lower limits of the swelling (FIGURES 1 and 3).

FIGURE 2. Phlox plants infested by *Tylenchus dipsaci*, stalks broken off clos to the ground for photographing; the feathery appearance of the plant at th right is sometimes still more pronounced. Note the apparently healthy sid branch of this plant.

FIGURE 3. Phlox plant infested with *Tylenchus dipsaci* with symptoms somewhat different from the ones shown by the plants in FIGURES 1 and 2. Note the side branch growing out of one of the leaf axils. Sometimes several such branches develop, producing a stocky or bunched appearance of the whole plant.

The lower leaves of the rosette may show a rolling inward of the leaf margins beginning at the base. Leaves which are put out later are more definitely rolled. Below the swelling mentioned the leaves are normal.

Some stalks appear to be badly infested from the very beginning and have no normal leaves. The nodes are shortened and the leaves develop but little blade surface, so that such a condition could be described as a witch's-broom stage. A stalk thus infested may never grow to a height of more than three or four inches before it dies. Other stalks may grow to be a foot high, although they may have few, if any, normal leaves. Occasionally a stalk will develop a normal side branch, while all the leaves on the main trunk are dwarf or spindling (FIGURE 2).

The most characteristic symptoms of the nematode trouble are, then, the elongated swelling on the stem, which is usually slightly bent at the lower limits of the swelling; the tendency of the leaves to become spindling and sharply pointed, or practically without expanded blades; and the browning and dying out of stalks with abnormal leaves. The first indication of infection in some cases appears to be a wrinkling of the leaf margins or the development of rugose leaves (FIGURE 4).

In one instance it was noticeable that of all the plants growing in the original bed, which was on a side-hill, the only ones which grew well last year and blossomed freely were the ones at the lower end of the bed. These plants had caught some of the soil washed down from above and were, therefore, generally better supplied with moisture.

The nursery planting from this bed consisted of 68 separate hills or clumps. Of these only 16 appear now to show no symptoms of nematode infection. Observations are being made on another collection from the same original planting. This bed contains the best plants taken from the abandoned plot and, as is to be expected, they are growing somewhat more normally, although many of them show stalks dying in the advanced stages of the disease.

With the help of FIGURES 1–4, plant pathologists and growers may be able to recognize the *Tylenchus dipsaci* disease of phlox. Final decision should rest on a determination of the actual presence of the nematode.

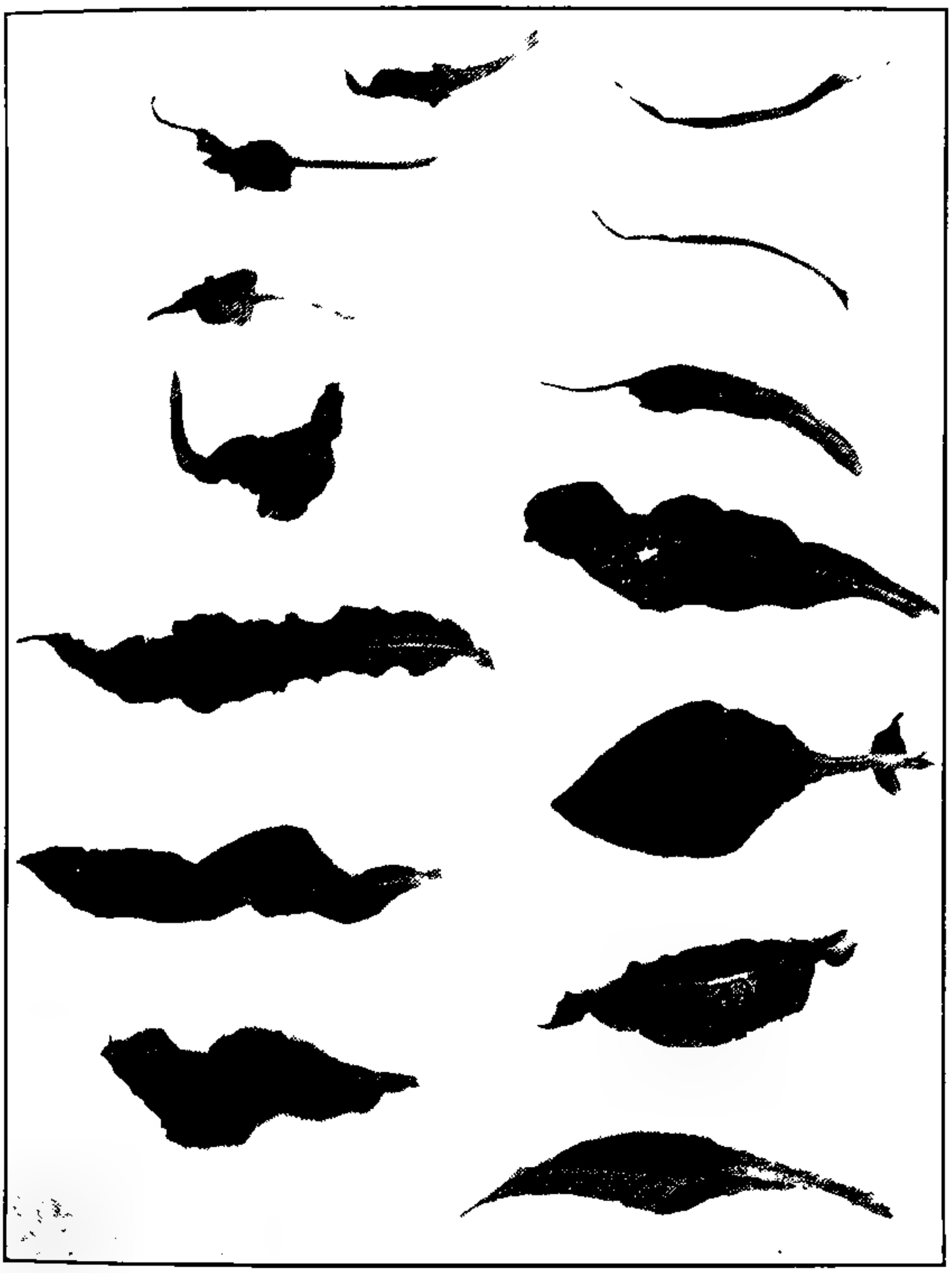

FIGURE 4. Various types of phlox leaf deformity caused by *Tylenchus dipsaci*.

As to control measures, it is best to dig out all infested plants, with the surrounding soil, and to burn all diseased material. No statements can be made at present as to the cure of infested phlox plants by a hot water or other treatment. The diseased ground is

best planted to ornamentals or crops which are immune to the bulb- or stem-nematode, *Tylenchus dipsaci.*

Literature Cited

1. **Landgraf, Th.** Die Älchenseuche beim Phlox. Die kranke Pflanze **4**: 153–156. *f. 1–5.* 1927.
2. **Nypels, Paul.** Maladies de plantes cultivées I. Maladie vermiculaire des Phlox. Ann. Soc. Belge de Microscopie **23**: Mém. 1–32. *pl. 1.* 1899.
3. **Osterwalder, A.** Nematoden an Freilandpflanzen. Zeitschr. f. Pflanzenkrankheiten **12**: 338–342. 1902.
4. **Pape, H.** Stockkrankheit bei Phlox. Die Gartenwelt **31**: 532–533. 1927.
5. **Quanjer, H. M.** Een aaltjesziekte van de aardappelplant, de aantastingswijze en de herkomst van haar oorzaak, *Tylenchus dipsaci* Kühn. Tijdschr. Plantenzeikten **33**: 137–172. *pl. 9–13.* 1927.
6. ————————. Bridging hosts. Rec. Trav. Bot. Néerl. **25A**: 250–259. 1928.
7. **Ritzema Bos, J.** Twee tot dusver onbekende ziekten in *Phlox decussata.* Tijdschr. Plantenziekten **5**: 27–32. 1899.
8. ————————. Het stengelaaltje (*Tylenchus Devastatrix*) en de tegenwoordig in de bloembollenstreek heerschende aaltjesziekte der Narcissen. **I.** Tijdschr. Plantenziekten **23**: 99–135. 1917.
9. **Schwartz, M.** Nematoden Untersuchungen. Mitt. Kais. Biol. Anst. f. Land. u. Forstwiss. Heft 12. p. 26–27. 1912.
10. **Weiss, Harry B.** The occurrence of the devastating nematode of Europe, *Tylenchus dipsaci* Kühn, in New Jersey. Circular No. 64. Bureau of Statistics and Inspection, Dept. of Agriculture, State of New Jersey. 1–4. 1923.

G. Steiner,
Senior Nematologist, Bureau of Plant Industry,
Washington, D. C.,
and
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THE FULVOUS DAYLILIES—II. THE WILD FULVOUS DAYLILIES OF THE ORIENT

In a preceding article[1] three groups of cultivated fulvous daylilies, including several clons, were discussed and the question raised as to whether any one of them is duplicated or even closely represented in the wild. The double-flowered clons Kwanso and Flore-Pleno and the variegated forms are, it would seem, of horticultural origin and existence. It is certain that the Linnaean type of *Hemerocallis fulva* was in cultivation in Europe at least as early as 1576, and as this particular type exists only as a horticultural clon it has been suggested[1] that it be known as *H. fulva* L. clon Europa or simply as Daylily Europa. What the natural relatives of this clon are like is a matter of special interest from the standpoint of both botany and horticulture, and with this in mind the fulvous daylilies of known wild origin and of close relationship to the Daylily Europa may be surveyed.

The Hemerocallis disticha of Donn

Evidently no fulvous daylily other than the clon Europa found its way into Europe until about 1798. Record of such a daylily is found in a catalog of the plants in the Cambridge Botanical Garden, England, published in 1804 by James Donn. The name *H. disticha* is given, but the only description is the one word "spreading." No statement is made of the origin of the plant, but the date of the introduction is recorded as 1798. Donn also lists the *H. fulva* of Linnaeus; hence it is certain that his new species *H. disticha* was different from the Europa Daylily.

No description of the *H. disticha* appeared until 1823, when a colored plate was published by Sweet (British Flower Garden, *pl. 28*). The flower is described as light-brown orange in color, the perianth-tube as 1½ inches long, and the segments as lanceolate, spreading, and about 3½ inches in length. The plant illustrated was obtained from a nursery in England, but it is stated that it was of a type native in China and that plants of this type had been in cultivation in England for some time, although they were seldom known to yield flowers. The description and the colored plate make it clear that this was a fulvous daylily which

[1] Stout, A. B. The Fulvous Daylilies—I. Jour. New York Botanical Garden **30**: 129–136. 1929.

was new and somewhat distinct from the old *H. fulva* of Linnaeus.

It is a strange coincidence that David Don in 1825 (Prod. Florae Nepalensis) lists under the name *Hemerocallis disticha* a daylily which he reports to be growing wild in Nepal. Don had seen a mere reference to the *H. disticha* of James Donn, but evidently did not know of the description and colored plate published by Sweet. Since Don describes his plant as having yellow flowers it seems certain that he did not have a fulvous daylily.

It may be noted that frequently references to the fulvous daylily *H. disticha* of Donn and of Sweet are, by omission of the final " n," credited to " Don."

The Hemerocallis longituba of Miquel

In 1867 the Dutch botanist Miquel described certain dried herbarium specimens as a new species, *Hemerocallis longituba.* He was not certain whether the plants had been collected as wild or as cultivated in Japan or elsewhere. The color of the flowers was supposed to have been pale fulvous. The most characteristic feature of the flowers is the length of the perianth tube, said to be 1 to 1¼ inches long. Miquel makes no mention of the *H. disticha* of Donn and of Sweet, the perianth tube of which is equally as long.

The Hemerocallis fulva angustifolia of Baker

The next type of daylily that was considered to belong with the species *H. fulva* was described under the varietal name *angustifolia* in 1871 by Baker (Jour. Linn. Soc. 11: 359). Baker describes his plants as very small, with scapes scarcely a foot tall, and with leaves only 12 to 18 inches long and only 2 to 4 lines wide. The segments of the flowers are described as narrow and acute; but there is no mention of color.

Baker based the description on dried specimens which he states came from (1) Khasia, India (in the Hooker Herbarium), and (2) Guriev and Karabagh, collected by Fischer. Guriev is near the extreme northwestern side of the Caspian Sea, and Karabagh is further south and in Caucasia.

In a volume on Japanese plants by Matsumura (Nippon Shokubutsumeii. 1884), *H. fulva* var. *angustifolia* Baker is listed and

the Japanese name Ki-suge is given, but what this plant was like I am not able to determine and it does not appear to be included in any other list of Japanese plants. In a later volume (Index Plantarum Japonicarum **2**: 198. 1905), Matsumura makes no mention of this variety in listing the kinds of daylilies known for Japan.

There is no evidence submitted by Baker that the flowers of these specimens had an element of fulvous coloring. For all we know this dwarf form with narrow leaves may be related to one of the types recently described as *H. Forrestii, H. nana,* or *H. plicata.* Baker's plants may be disregarded in considering the fulvous daylilies, and especially any type to be included with the *H. fulva* of Linnaeus or to be considered as closely related to it.

The H. fulva longituba of Maximowicz

The Russian botanist Maximowicz described in 1885 (Gartenflora 34: 98, *pl. 1187*) and illustrated with a colored plate certain daylilies of a type obtained from the wild in the Hakone Mts. of Japan and said also to be in cultivation in Japan. The flowers are described as orange-yellow with slight fulvous tinges and as having the perianth-tube long and narrow. This type is described as different from the *H. fulva* of Linnaeus (the clon Europa) in having narrower leaves, and flowers with less fulvous color and a longer perianth-tube. The description by Maximowicz is followed by a note by E. Regel, Director of the Botanical Garden in St. Petersburg, stating that in good garden soil these wild plants differ from the old form of *H. fulva* chiefly in having a long perianth tube.

The Hemerocallis fulva clon Maculata

Of all plants thus far obtained from the wild in the Orient, the one giving rise to the clon Maculata is most like the Daylily Europa. The coloring of the flowers is only slightly different; the fulvous shades in the outer half of the opened flower are slightly paler and the arching band across the mid-section of the petals is slightly darker. The flowers are larger than those of Daylily Europa and the petals are of a different shape. The plants are later in the period of blooming, but they are very similar in habit of growth except that the scapes are slightly

FIGURE 5. Flowers of fulvous daylilies: at right, the old familiar *H. fulva* clon Europa; above, the *H. fulva* clon Maculata; below and at left, of two wild plants from the Orient. There is much variation in the shape of the petals and in the degree and the shade of coloring but the general color pattern is quite the same.

shorter. A colored plate showing a flower and a capsule of this clon has recently been published in Addisonia (**14**: *pl. 460*).

The origin of this Daylily Maculata is well known. Padre Giraldi sent to Florence, Italy, seeds or living plants from wild stock growing near Shen-si, China. Either one plant was grown or one plant was selected as the best among several different plants. This was propagated, and was soon grown at the botanical garden in Florence. Plants of this clon came to the attention

of Professor Baroni, who described them as *"H. fulva* var. *maculata"* (Nuovo Giorn. Bot. Ital. II. 4: 306. 1897). Soon thereafter plants of this clon were obtained by C. Sprenger in Naples for distribution to the trade. The New York Botanical Garden has been favored with living plants of this stock by Willy Müller, nephew of C. Sprenger, who was associated with him in nursery work and who still continues this business in Naples. Plants have also been obtained from other nurserymen who have offered the Daylily Maculata for sale. All these plants have been identical in every particular. They are all self-fruitless and they set no seed to pollination among themselves. They can be propagated only by division and they very clearly belong to one clon and for this reason the name Maculata may be used as a clonal name instead of as the botanical designation for a natural variety.

In several respects the Daylily Maculata is a more attractive garden plant than the Daylily Europa. Its flowers are larger, the color-pattern is slightly more bold in its contrasts, and the scapes are somewhat shorter, which brings the flowers slightly nearer to the foliage.

The Hemerocallis fulva clon Hupehensis

This clon was derived from a seedling plant grown by C. Sprenger in Naples, Italy, from seed collected by Padre Cypriani in Hupeh, China. The first published mention of the clon appears to be in the Gardeners' Chronicle in 1906 (III. 40: 158), where the flower is described as "reflexed, undulating, bright coppery red, with yellow throat."

The H. fulva clon Cypriani

This clon has the same source and history as clon Hupehensis. Sprenger evidently selected for propagation two seedlings, grown from the seed obtained from China, or it is possible that he only obtained two seedlings from the seed that came to him from China. This clon has flowers described by Müller (Gard. Chr. III. 40: 159) as "coppery red with a golden centre and a well marked golden line down the middle of the petals. The form is gracefully reflexed."

FIGURE 6. A wild plant from China, showing the short perianth-tube and the broader petals almost as in the Europa Daylily. The color is, however, a fine sprightly red that approaches pink, with a darker eye-zone.

FULVOUS DAYLILIES OF WILD ORIGIN GROWN AT THE NEW YORK BOTANICAL GARDEN

The most reliable information regarding the character of the wild fulvous daylilies which the writer has been able to obtain has been secured by the study of living plants brought from the wild state in the Orient and grown for several years at The New York Botanical Garden. From Dr. A. N. Steward, of Nanking University, there were obtained 17 different seedlings collected at Kuling, China, and 20 plants from Purple Mountain near Nanking, China. Also 31 different plants were obtained from several localities near Sapporo in the island of Hokkaido, Japan, through

the kindness of Professor Y. Hoshino and Professor T. Susa of the Hokkaido Imperial University.

These plants are all very much alike in general habit of growth. The leaves are light green, medium coarse, strongly distichous, and ascending-curving. The scapes stand at a height of about four feet. Compared with the Daylily Europa, they have foliage that is less robust and scapes that are somewhat shorter. There is, however, the same feature of spreading rhizomes and the capsules are of the same type.

In respect to the precise character of the flowers there is much variation among these plants. For the majority of them the flowers have a long perianth-tube and the segments are long and narrow (see FIGURE 7). All have some shade of red in the coloring of the face of the flower and in most cases there is a darker zone just outside of the throat of the flower. The plants from Japan have the duller and more brownish shades; some of those from Kuling have bright shades of pink and red. The flowers of one plant are coral-red in general color with an arching zone of garnet red in the midsection of each petal.

Individual plants in any one of these groups from Japan, or from Kuling, or from Purple Mountain in China may be selected which agree closely with the *H. disticha* of Donn and of Sweet, or with the *H. longituba* of Miquel. Others are almost identical with the *H. fulva* clon Cypriani named by Sprenger. For a few of the plants the shape of the flower (see FIGURE 6) is nearly the same as that of the Daylily Europa (the *H. fulva* of Linnaeus), but no plant is a duplicate of the Daylily Europa or as near to it as the *H. fulva* clon Maculata.

THE FULVOUS DAYLILIES IN THE LITERATURE OF ORIENTAL PLANTS

Various botanical treatments by Japanese botanists and by Europeans who have observed or collected plants in Japan and China make mention of fulvous daylilies. For example, the woodcuts published by Iinuma in 1874 (Somoku-Dzusetsu, 2nd ed. vol. 6) illustrate two types later identified by Makino (Somoku-Dzusetsu 3rd ed. 1910) as *Hemerocallis fulva* L. var. *Kwanso* Regel and *H. fulva* L. var. *longituba* Maxim. In various lists of species the names *H. fulva* and *H. disticha* are given and

FIGURE 7. A wild plant from China, showing the long perianth-tube, and narrow segments. In comparison with the flower shown in FIGURE 6 there is less of an eye-zone and the colors are paler and more fulvous. This is the type of flower described as *H. disticha* by Donn and by Sweet, as *H. longituba* by Miquel, and as *H. fulva longituba* by Maximowicz. FIGURES 5, 6, and 7 show well, except for portraying the shades of color, the variations in the flowers of plants that are at present included in the species *H. fulva*

in a few cases both names are included in one list. In most cases, however, all the single-flowered types of the fulvous day-lilies other than the *H. aurantiaca,* which will be discussed in a later article, are included in the name *Hemerocallis fulva,* but by some writers they are all called *H. disticha* and in a few instances the names listed are *H. fulva* and *H. fulva* var. *longituba.*

In none of these descriptions and lists is there a critical discussion of the types and variations that were observed, and adequate

descriptions and comparisons of the cultivated and the wild types are not made.

Conclusion

It is clear that the wild fulvous daylilies of the Orient which are most closely related to the *Hemerocallis fulva* clon Europa are a variable group of plants. There are wide variations in the shape of the flowers and in the degree and the shade of the fulvous or red colorings, even among plants of the same locality. Such variations have given rise to the several names discussed in this article. Judging from the living plants obtained from the wild, it would seem that the type described as *H. disticha* by Donn and by Sweet includes fully the *H. longituba* of Miquel and the *H. fulva longituba* of Maximowicz. The plant *H. fulva* L. clon Europa is rather closely approached in respect to the shape of flower and general coloring by some of the wild plants but is not duplicated.

For the wild plants there are two extremes in the shape of the flowers: the one with a short perianth-tube and usually broader segments; the other with a long tube and narrow segments. Possibly a more complete knowledge of the natural distribution of these forms may reveal that there are really two distinct species which are more or less intermingled and hybridized in certain areas. At the present time it will, perhaps, be best to include the variations here discussed, both of the wild and of the cultivated plants, in the one species *H. fulva* L., of which the clon Europa is the historical type. If a botanical name is to be used to designate the type with a long perianth-tube, the proper combination is *H. fulva* var. *longituba* Maxim. With this treatment the name *H. disticha* of Donn and of Sweet and the name *H. longituba* of Miquel become synonyms.

The individual seedlings that are brought from the wild and propagated asexually, as several have been, give rise to clons and hence, in several cases at least, the scientific names applied to such clons may now be used merely as horticultural names.

While the exact counterpart of the *H. fulva* of Linnaeus (the clon Europa) has not yet been discovered among the wild daylilies, plants very closely related to it have been found. Evidently the original seedling which was propagated to give the Daylily Europa was one of this group of fulvous daylilies.

Some of the variations among these daylilies of the species *H. fulva* are certain to be of value in culture and in the breeding for new horticultural types. Already in the breeding work at The New York Botanical Garden the plants with pink and red colorings in the flowers have been used in selective breeding and seedlings obtained that are of sprightly and pleasing shades of bright red.

A. B. Stout.

THE COCONUT-PALM—COCOS NUCIFERA*

Later Planting and Intensive Cultivation in Florida

After the activities described in the preceding paragraphs had subsided, a second period of interest in the coconut was ushered in by the developments inaugurated and carried on by Commodore W. J. Matheson on Key Biscayne and other places in southern Florida. The following description of the activities at Key Biscayne have been furnished by the Honorable Hugh M. Matheson, who is in charge of the planation.

"The soil of Key Biscayne is generally a loose, calcareous sand, with a small amount of humus, giving it a slightly dark color. The fresh-water table stands, on an average, about three feet below the surface of the ground. Just above this water table is calcareous marl or hardpan. Before exposing this hardpan to the air, it can easily be penetrated by roots and cut with a spade. When exposed to the air, it becomes quite hard and makes an excellent road-dressing. The best results obtained in planting coconuts occurred where the water table did not exceed two feet below the surface of the ground. The fresh-water table fluctuates with tide, both daily and seasonal, and also with the seasonal rains.

"The native growth found on the Key was practically all saw-palmettos of enormous size, mixed with other growth, such as sea-grapes, cabbage-trees, and poison-wood. The best results in coconut planting were produced on rather low land thickly covered with large saw-palmettos. The soil seems to have been poorer where the proportion of native growth was small, the scattered saw-palmettos being heavily mixed with sea-grape and poison-wood.

* Continued and concluded from Jour. N. Y. Bot. Gard. **30**: 153–161. Jl 1929.

FIGURE 8. A group of coconuts on Bay Biscayne, cultivated for ornament. Coconut palms flourish in many parts of the coastal region of southern Florida as well as anywhere in the tropics. The palms grow very rapidly in their earlier years and are said sometimes to begin to bear fruits in their seventh year. The mature plants are "everbearers."

"When the present owners of Key Biscayne first cleared the land there were a few coconut palms growing in one or two small areas near the ocean. These small patches of palms were the sole survivors of the 76,000 coconuts and coconut sprouts planted by Field and Osborn in the spring and fall of the years 1883 and 1884. This planting was carried on as follows: A schooner was loaded with coconuts at Trinidad—the nuts delivered on the boat costing one cent each—and the cargo was landed on the shore of Key Biscayne. The majority of the nuts were bedded and, according to the foreman who did the work, less than 5 per cent. of these nuts sprouted before they were planted out. It is said that roads were cut every quarter of a mile along the coast from the ocean to the mangroves on the west side of Key Biscayne; intersecting roads running north and south a quarter of a mile apart were also made. The roads were fifteen feet wide. Transportation having been made easy in this way, the nuts were planted, 110 to the acre. A small circle, possibly three to four feet in diameter, of the original native growth, principally saw-palmettos, was grubbed and the nuts set in the center. These nuts were cared for to some extent for three years, the care consisting principally in poisoning the rats and rabbits—rabbits being the greater pest. The rabbits particularly like the young, tender sprouts, and after they have eaten this off repeatedly, the coconut dies. It is also known that fires have occurred periodically on Key Biscayne for many years, some being started by carelessness, and others intentionally by fishermen. These fires probably destroyed what coconuts the rabbits left, with the exception of possibly 30–40 trees on the ocean front, mentioned above.

"Small areas were first entirely cleared of all native growth, by grubbing up the saw-palmettos and other growths and burning them in heaps.[12] The land was then plowed. The first coconuts were planted with the idea of using them as wind-breaks for other trees, such as citrus. The first planting along this line was done in 1910. There was practically no other preparation of the ground made than the clearing before sprouts or germinated nuts were planted. Very little care was given these sprouts but some fertilizer was used until the trees became about three years old. The first trees were set on each side of the roadway and used with Australian pines as wind breaks. They were set about twenty feet apart and close to them were three rows of Australian pines. In all instances, the sprouts or germinated nuts were used instead of the unsprouted nuts.

[12] Various improvements were made over first original method of clearing palmettos until now, when it is done by machinery. The chopped up roots of palmettos serve now as mulching for young coconuts and road surface.

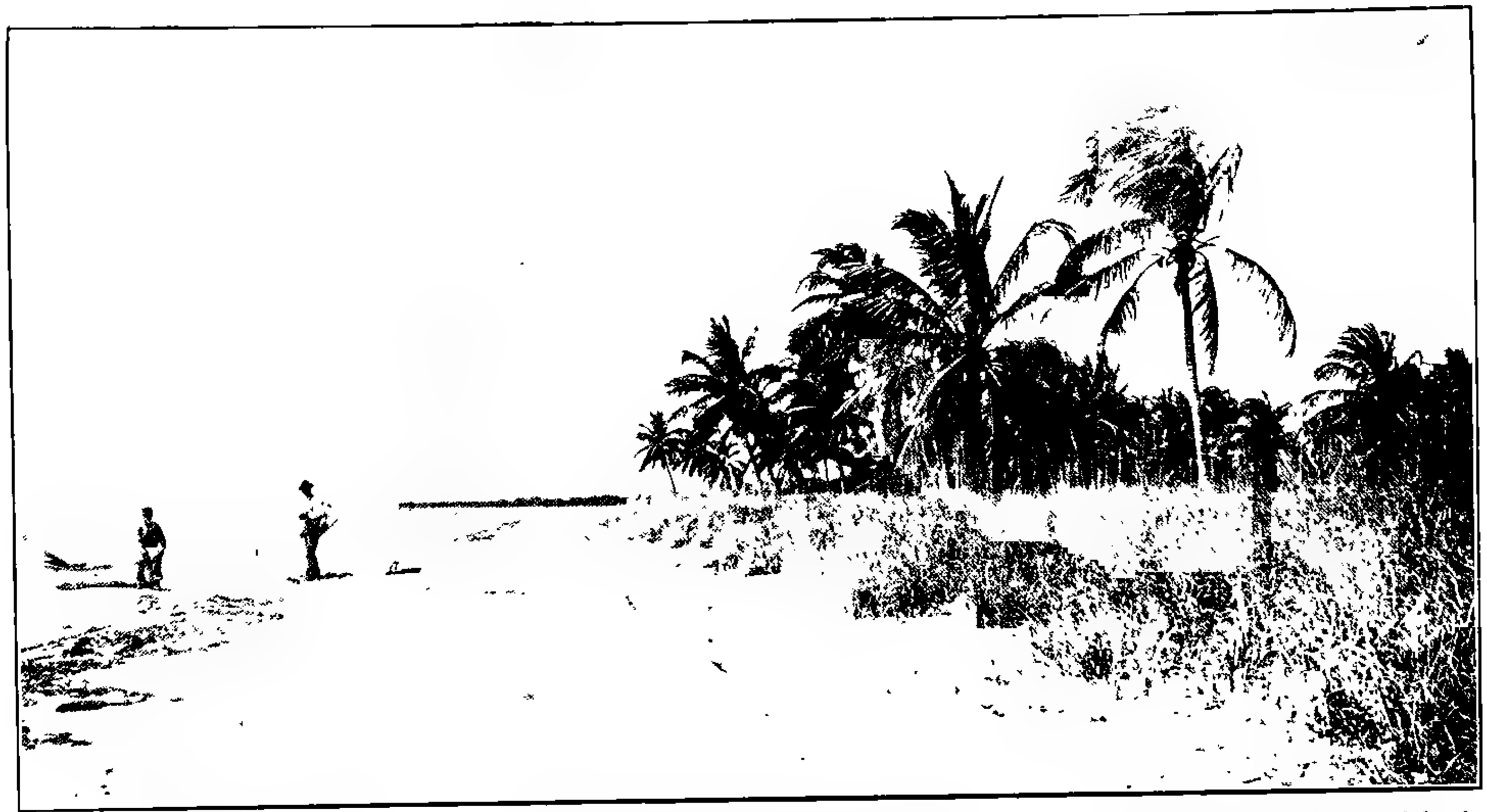

FIGURE 9. Edge of a coconut grove on Cape Sable (East Cape, the most southern point, by nearly a degree, of the mainland of the United States). Large groves were formerly set out on Cape Sable for commercial purposes.

"Where an immediate effect was desired along one or two roads, large, bearing coconut palms were planted. However, experience has shown that the small germinated nuts outstripped these large trees in growth in five or six years, and the large trees did not bear well for eight or ten years, by which time the small palms also had come into very fair bearing.

"It has been found that bloom generally occurs in about five or six years, but the nuts do not 'set' to any appreciable extent until the eighth year; and trees seem to come into good bearing in about ten years.

"All the coconuts were originally planted with two ideas in view, that of furnishing wind-breaks for citrus trees and for ornamental purposes. With the idea of making a complete wind-break in as short a time as possible, Australian pines (*Casuarina equisetifolia*), were planted several rows deep in strips as wide as twelve feet. Along the roadway a single line of coconuts was planted on the inside of these lines of Australian pines. The Australian pines quickly outgrew the coconuts, giving them more shade than they needed and absorbing most of the food and water from the soil, to the distinct detriment of the coconut palm. As the Australian pines make an ideal wind-break, they were not interfered with until the winter of 1919, when it was found that the lime trees planted in the grove were not a commercial success. At this time the Australian pines were thinned out but not entirely removed. A remarkable improvement was noted in the condition of the coconut palms a short time after these Australian pines were removed. More of the Australian pines will be removed in order to give the coconuts a better chance.

"About the time when it was realized that the lime grove would not be a commercial success, more coconuts were planted, some in grove formation, with the idea of beautifying the estate and also with the idea of actually realizing some profit on the sale of the nuts. During the past year (1920) all the lime groves have been planted with coconut palms, in most instances without removing the lime trees which had been abandoned and in some cases had died out. These small palms are doing very well and will in a short time make a magnificent grove.

"The annual yield per tree can hardly be determined yet, owing to the fact that the trees have been planted almost continuously since original planting, and no separate records have been kept of the yield from individual trees or from certain groups. The only records of the annual yield were from the grove as a whole, and as some trees were only just coming into bearing and others bearing fairly well, no authentic data can be given. The fact that the oldest trees were handicapped by being crowded with the fast growing Australian pines would also make an estimate of nuts per tree at that time abnormally low. However, we expect to get an average of not less than forty nuts per tree annually.

"One of the most difficult problems we have encountered is that of getting the young trees established and growing before rabbits kill them by eating out the terminal bud and other young foliage. These rabbits, which are really not true rabbits at all but large marsh-hares, are extremely plentiful and efforts to reduce their number by trapping and shooting have proved of no avail. Poisoning has not been resorted to on account of the danger of killing other animals and birds. Rabbit drives such as are conducted in New Zealand and in the western United States cannot be undertaken on account of the near proximity of the mangrove swamp and certain uncleared patches of native scrub palmettos. Rabbit guards made of poultry wire nailed to three stakes have been used extensively. These, however, are very expensive on a large scale and had to be abandoned.

"The solution of the rabbit problem has practically been arrived at during the past season (1920) by applying 'Tree Tanglefoot' directly to the base of the young plants and around the bud. This material is extensively used in the North on elm trees. Rabbits absolutely refuse to have anything to do with a plant treated in this manner. No serious effect from applying this material has been noticed on the young sprouts and several thousand have been treated, some of them having undergone this treatment during eight months. The cost is negligible compared with that of fencing.

"Organic disease and insect pests are very few and seem to have little bad effect on the trees. There are some scale insects, notably *Aspidiotus Destructor*, and the cottony cushion scale is present at times, but prefers other foliage. A small beetle that works in the blossom and the small set nuts, seems to be one of the greatest menaces, as it causes a great many of the small nuts just forming to drop. There has also been observed a minute borer which works in the trunk of some of the trees and is described in some of the coconut books as the shot-borer, but no appreciable harm has been noticed from this insect. Perhaps two dozen trees have been lost during the last four or five years through undetermined causes, in which considerable fungi were found, but no evidence to show that this is the well-known bud-rot found in other coconut countries. Compared to diseases and pests that coconut trees are subject to in South America and some other countries, our troubles are negligible.

"Practically the entire crop of perfect and marketable nuts has been sold locally in the husk to dealers who resell them to the tourists, these nuts being used for mailing as souvenirs and to people who grow them as ornamental plants. A very fair profit is thus realized.

" The nuts seem to contain as much oil and in some cases more than South American nuts, according to statistics. In one case where oil was extracted experimentally, we got as high as one quart from twelve well-developed nuts. This oil was analyzed in the northern market, and it was said, corresponded to a very high grade of Cochin oil, and delivered in New York City on the basis of the present market (fall of 1921) was worth ten cents per pound in barrels.

" Owing to the cost of labor and to the inflated value given to the unhusked nut locally, no other experiments, such as making copra or other products, have been attempted. However, we have the following data which might be of interest, comparing our high wages with the wages paid in the coconut countries.

" During the winter of 1919 there were 12,563 coconut palms growing, and of this number 2,394 were bearing or were in flower. A total of 953 ' skips ' existed, that is, places where trees had been planted but had not survived. These skips are largely caused by rabbits eating out the terminal buds. They have since been replanted to a great extent. At that time about 200 nuts a week were secured from the grove; to-day (fall of 1921) about 800 are produced. Since that date approximately 11,000 sprouted nuts have been planted. This makes a total of about 23,000 nuts that are planted in the field. About 6,000 sprouted coconuts are in nurseries, which number it is planned to plant this fall. This will give a grove of approximately 30,000 trees, which is probably at least twice as big as any other one grove in this country.

" The weather conditions existing on Key Biscayne cannot be compared with conditions existing in other places where coconuts are grown on a commercial scale, as the winters are undoubtedly too cool for the proper development of the nuts and the growth of the palms. However, this is largely off-set by the fact that this palm locally is not appreciably bothered by the enemies to the coconut palm present in other regions. Of course, the price of labor is a great drawback to any commercial undertaking. As compared with coconut growers of South America and the East, labor is at least four or five times as expensive.[13]

" The soil conditions on Key Biscayne are unique, even in this part of the country, as there is no rock found and the water table seems to be just right for the proper development of the trees.

" In regard to the cold snaps in the winter, only once during the past twelve years has the cold actually affected the foliage to

[13] In Java a woman collects three hundred coconuts, husks them, splits them, digs the meat out, puts it in the sun, dries it, bags it, and delivers it to the warehouse. For this she gets eight cents. If she has collected less she gets proportionately less. This is just a bare starvation prevention wage and is made possible by the Dutch Government's importing rice and selling it at or below cost.

any marked degree. But after a cold snap the fruit is apt to fall before it is matured and the matured fruit hanging on the trees sours.

"Situated as Key Biscayne is, a short distance from the Gulf Stream,[14] the temperature does not reach the extreme that it does on the mainland only a short distance away."

A later letter includes the following remarks:

"The Coconut Grove on Key Biscayne, although one of the most northerly of any size, is not immune to a lot of trouble that other large groves are subject in the tropics, *viz.*:—hurricanes. In 1926, a West Indian hurricane passed over the island, blowing down, or breaking thousands of coconut palms.

"Fortunately, there were thousands of coconut palms planted that had not attained any great height; in fact, had not even come into bearing. These palms being lower and perhaps protected by taller trees, withstood the blow very satisfactorily. There are now about thirty thousand coconut palms growing on Key Biscayne, of which only about half are palms that were growing before the hurricane of September, 1926.

"The value of treating young coconut palms with certain brands of sticky substance like tree 'tangle foot' to prevent rabbits eating them, seems doubtful in the light of further experiments. The caustic nature of some of these preparations seems to 'burn' the tender plants, and although, no doubt, a preparation could be made or bought that would not 'burn' the plants, this treatment is no longer necessary on Key Biscayne on account of the rabbit pest being reduced.

"After many years of experiment, it would seem that the trees in most coconut plantations are set out too thickly. It is a great temptation to plant the palms too close together, in order to get more trees to the acre and with the idea of increasing the yield per acre in nuts. This theory does not work out in practice. The coconut palms will grow and thrive planted as close as twenty feet, but the best yield per acre seems to occur when the palms are planted as much as thirty-five feet apart.

"The coconut grove on Key Biscayne is situated in a latitude in which coconut palms are not supposed to flourish as in the true tropics; nevertheless, being practically immune from the disease of the tropics, the result is most satisfactory and the grove, which we believe is the largest grove situated in a latitude as far north,

[14] Advice given to Commodore Matheson by experts from Kew Garden, London, and Washington, D. C., was that coconuts would not grow at a point more than fifteen degrees north or south of the equator; to which Commodore Matheson replied he had a hot-water heating system in the close proximity of the Gulf Stream along the eastern shore of Key Biscayne.

would be of inestimable value, owing to the fact that it produces more seed nuts for Florida planting than any other single grove, and is of untold value for its ornamental, exotic, and landscape properties; even if it never produced coconuts in a commercial way, it might be considered profitable.

"Any pure stand of trees, palms or plants in as great a number as the stand of coconut palms on Key Biscayne is subject to disease, or scale troubles. The large apple orchards of the North and the citrus groves of the South are continually troubled with plant diseases, scale infestations, etc. In comparison with these, the troubles experienced in the coconut grove on Key Biscayne are practically nil. To be sure, a moderate amount of scale is present, which we take no notice of. A very few trees have had other troubles and altogether perhaps a hundred trees have been removed or have died, out of many thousands in a period of seventeen years, owing to disease. Our practice is not to doctor a sick tree, but burn it and replace it with a healthy one. This seems drastic, but has proved more efficient in keeping our groves clean and is commercially more economical in the end. This fact, coupled with the fact that the palm needs no further attention after five years except occasional cultivation with a disc harrow, would seem to set a record for a pure stand of any grove tree under cultivation in this country."

Miscellaneous Notes

Of course, the coconut-palm grows further north in Florida, with more or less immunity from cold, than the limits given in Commodore Munroe's and Commodore Matheson's notes.

On the western coast the grove at Caxambas on Marco Island, mentioned above, is in a flourishing condition.

Numerous trees are quite hardy along the southern shore of the estuary of the Caloosahatchee and nearby Gulf coast. Many specimens, however, were damaged in the "freezes" of 1886, 1894, and 1895, in exposed places.[15]

The northern limit of the coconut-palm as a dooryard plant on the western coast seems to be the Tampa Bay region.

In Manatee County only one tree survived the effects of the "freezes" of 1894 and 1895. This tree is now forty-five feet tall. More recently planted coconut trees are thriving and bearing coconuts along the Manatee River.[16]

[15] In letter from W. Stanley Hanson, of Fort Myers.
[16] In letter from Egbert N. Reasoner, of Oneco.

On the opposite side of Tampa Bay, about thirty years ago, a large tract on Pine Key was planted with coconuts, but to-day not one specimen survives. The Park Board of Saint Petersburg recently set out fifty trees on the water front, but only one or two trees are now living (1921). There is a tree in a sheltered position in Saint Petersburg that has borne three " nuts," but no trees thrive for any great length of time.[17]

On the eastern coast the coconut is hardy, if not planted in too exposed locations, as far north as the Saint Lucie River region. North of this region it persists, of course, for a time in sheltered locations, and specimens planted for curiosity's sake may be seen as far north as the Mosquito Lagoon region, but naturally they do not survive for any length of time.

The coconut excels our other palms both in foliage and in fruit. The color and the port of the crown are unique. In the language of the horticulturist, the palm is an " ever-bearer." The inflorescence of the bearing trees is a characteristic that attracts one's attention, for the trees are continuously in flower and in fruit, with a series of spadices bearing all stages of developing fruits, from little nubbins about the size of one's thumb to the mature fruits, which take nine months to develop to maturity from the flower.

The strength of the coconut stem (trunk) is marvelous. The old trees are very tall and have trunks so slender that it seems incredible that they can support the great crown leaves and, at the same time, the ponderous, but graceful, clusters of fruits. Yet they do, and, moreover, in a hurricane the trunks bend easily and bring the tops almost to the ground, whence they usually spring back to the perpendicular just as if nothing had happened.

JOHN K. SMALL

GIFT OF A MEMORIAL GARDEN BENCH

An annual member of the Garden has recently given and constructed a handsome garden bench from plans previously approved by the Board of Managers and by the Municipal Art Commission. The site is a short distance east of the Rock Garden on

[17] In a letter from Katherine B. Tippetts, of Saint Petersburg.

a path leading toward the Hemlock Forest. The landscape architects who designed the bench and supervised its construction have contributed the following description:

"The memorial is simple in design. Broad stone steps lead to a circle of turf under two great white oaks. At the rear of this circle is the bench, built principally of warm-toned granite, with an oak seat anchored to the central portion, above which, on the coping, is the inscription, 'In Memory of Elizabeth Bigelow Estes.' Low stone walls extend to the sides.

"The spot is enclosed in a plantation of mountain laurel, azaleas, flowering dogwoods, and hemlocks. From the memorial one looks southward to a framed vista of the Iris Garden."

The donor paid the entire expense of the work, except grading, sodding, and planting, which were done by the Garden, and has supplied the following paragraph for this record:

"The lady thus memorialized was of mixed New England and Southern ancestry, was all her life a resident of Brooklyn, where her father and mother settled in their early married life, and was highly esteemed by the public and much beloved and admired by a large circle of discriminating friends. For many years she was the sole remaining resident on Washington Street after that street became degraded by the opening of the Brooklyn Bridge and, later, its extension toward the City Hall. Her old-fashioned 'Boston swell' front, built for her mother by her Massachusetts grandfather, who sent masons and carpenters from Boston, believing that no New York artisans were sufficiently skillful, was noticeable amongst the brummagem shops on all sides, which had supplanted the fine old residences of a former day when the street was the chosen abode of fashion. In that home she lived amidst fine old family possessions, books, pictures, furniture, and Paul Revere silver, and dispensed to a small but choice circle a rare type of hospitality. The donor of the gift hopes that the seat may serve the double purpose of pleasing the visitors to the Park, while perpetuating the name of a very beautiful and distinguished personality."

NOTES, NEWS, AND COMMENT

Dr. Fred J. Seaver, Curator, has spent a month's vacation in Colorado and is giving another month to the collection and study of the cup-fungi in that region. Early in August he attended the western summer meeting of the Botanical Society of America at Laramie, Wyoming.

With a recorded precipitation of only 1.13 inches in June and 0.74 inch in July, and with temperatures above the normal, the Garden, in common with large areas of the eastern and central states, has suffered considerably from drought during the summer months.

Dr. N. L. Britton has been elected Honorary President of the recently organized "Cactus and Succulent Society of America," of which Dr. A. D. Houghton is President and Mr. R. E. Willis, of Los Angeles, California, is Secretary. The first issue of the Journal of the new society, published in July, 1929, records that the membership has already reached 350, widely distributed, and that the four-volume work on "The Cactaceae," by Dr. Britton and the late Dr. J. N. Rose, has been adopted for purposes of identification; this is characterized as giving "priceless information pertaining to our study of xerophytes."

A pair of epiphytic orchid plants (*Encyclia tampensis*) were brought to the Garden last year from an island of Florida east of Key West by Dr. John K. Small, Head Curator. Each plant consists of approximately 1200 pseudobulbs. The large number of living pseudobulbs, taken in connection with the number that may be assumed to have decayed during the life of the plant, indicates a great age. One of the plants is still resting, while the other has been in flower in Conservatory Range No. 2, bearing several hundred flower-stalks, each with three to eight yellow flowers.

Meterology for July. The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: 89° on the 6th; 92° on the 8th, 10th, and 11th; 83° on the 16th; and *95° on the 28th.* The minimum temperatures recorded were *51° on the 4th;* 57½° on the 13th; 54° on the 21st; and 60° on the 22d. The total precipitation during the month was 0.74 inches.

ACCESSIONS

Additions to the Collection of Dahlias (1929)

84 roots, 35 varieties. (Given by Dr. M. A. Howe.)

24 roots, 9 varieties. (By exchange with Mr. Leo Ritter.)

22 roots, 15 varieties. (Given by Mr. J. J. Broomall for Success Dahlia Gardens.)

16 plants, 15 varieties. (Given by Fisher & Masson.)
16 roots, 3 varieties, and 13 plants, 7 varieties. (Given by Dahliadel Nurseries.)
16 roots, 9 varieties. (Given by N. Harold Cottam & Son.)
16 roots, 8 varieties. (Given by Blue Ribbon Dahlia Co.)
15 plants, 13 varieties. (Given by Mr. James Smith.)
15 roots, 8 varieties. (Given by Mr. Fred von Rodeck.)
13 roots, 13 varieties. (Given by W. Atlee Burpee Co.)
13 small clumps, unnamed varieties. (By exchange with Mrs. Alicia L. Neary.)
12 plants, 12 varieties, and 2 roots, 1 variety. (Given by Success Dahlia Gardens.)
12 plants, 12 varieties. (Given by W. H. Waite's Gardens, Inc.)
12 plants, 1 variety. (By exchange with Mrs. Charles H. Stout.)
12 roots, 8 varieties. (By exchange with Mrs. Carl Sherwin.)
12 roots, 6 varieties. (By exchange with Mr. George Schwacha.)
12 roots, 6 varieties. (Given by Mr. William Seltsam.)
10 roots, 10 varieties. (By exchange with Mr. Albert Parrella.)
9 roots, 2 varieties, and 3 unnamed varieties. (By exchange with Mr. Gunther Ackerman.)
8 plants, 8 varieties. (By exchange with Serg. Michael A. Batto.)
7 plants, 7 varieties, and 2 roots, 2 varieties. (By exchange with Dr. Frank R. Waite.)
7 plants, 5 varieties. (Given by Mr. C. Louis Alling.)
7 roots, 3 varieties. (Given by Mr F. S. Cackener.)
6 roots, 6 varieties. (By exchange with Mr. Thomas Corrigan.)
6 roots, 6 varieties. (By exchange with Mr. Wm. S. McNeely.)
6 roots, 6 varieties. (Given by Mr. George L. Stillman.)
6 roots, 3 varieties. (Given by Ketner Dahlia Gardens.)
5 roots, 4 varieties. (By exchange with Mr F. Lighte.)
5 roots, 2 varieties. (By exchange with Dr. Herman Trossbach.)
4 roots, 4 varieties. (By exchange with Mr. J. H. Branson.)
4 roots, 4 varieties. (By exchange with Mr. Charles Neumann.)
4 roots, 3 varieties. (By exchange with Mrs. Edythe McDonald.)
2 plants, 1 variety. (Given by Mr. Frederick E. Dixon.)
2 roots, 2 varieties. (By exchange with Mr. Timothy Murphy.)
2 roots, 2 varieties. (Given by Mr. W. Evans Smith.)
1 clump. (By exchange with Mr. F. C. Hoffstadt.)
1 clump. (Given by Dr. A. B. Stout.)

LIBRARY ACCESSIONS FROM JUNE 1 TO JULY 31

Bailey, Liberty Hyde. *Talks afield about plants and the science of plants.* Boston, 1885. (Given by Dr. J. H. Barnhart.)
———. *The garden lover.* New York, 1928.

BARTRAM, WILLIAM. *Travels.* New York, 1928. (Given by Mrs. Raymond Robins.)

BERGEY, DAVID HENDRICKS, & OTHERS. *Bergey's manual of determinative bacteriology: a key for the identification of organisms of the class Schizomycetes . with an index by Robert S. Breed.* Ed. 2. Baltimore, 1925.

BROADHURST, JEAN. *Bacteria in relation to man: a study-text in general microbiology.* Philadelphia, ©1925.

CHENEY, RALPH HOLT *Coffee: a monograph of the economic species of the genus Coffea L* New York, 1925.

CLEMENTS, EDITH GERTRUDE (SCHWARTZ). *Flowers of coast and sierra.* New York, 1928.

———. *Flowers of mountain and plain.* Ed 3. New York, 1926.

CLEMENTS, FREDERIC EDWARD. *Plant succession and indicators.* New York, 1928.

CLEMENTS, FREDERIC EDWARD, & CLEMENTS, EDITH GERTRUDE (SCHWARTZ). *Flower families and ancestors.* New York, 1928.

COKER, WILLIAM CHAMBERS, & COUCH, JOHN NATHANIEL. *The Gasteromycetes of the eastern United States and Canada* Chapel Hill, 1928.

COOKE, MORDECAI CUBITT, & QUÉLET, LUCIEN. *Clavis synoptica Hymenomycetum Europaeorum* London, 1878. (Given by Miss C. C. Haynes.)

COSGROVE, JESSICA G. *Gardens: quick results with flowers and vegetables.* New York, ©1925. (Given by Dr. J. H. Barnhart.)

EATON, AMOS. *Botanical grammar and dictionary; translated from the French of Bulliard and Richard* Ed. 3. Albany, 1928.

ELLWANGER, GEORGE HERMAN. *The garden's story, or; pleasures and trials of an amateur gardener.* New York, 1889. (Given by Dr. J. H. Barnhart.)

FORBES, ARTHUR C. *The development of British forestry* London, 1910. (Given by Dr. J. H. Barnhart.)

FOX, HELEN MORGENTHAU *Patio gardens . with illustrations by Ralph L Reaser* New York, 1929.

GÄUMANN, ERNST ALBERT. *Comparative morphology of fungi trans lated and revised by Carroll William Dodge.* New York, 1928.

GARDNER, VICTOR RAY, BRADFORD, FREDERICK CHARLES, & HOOKER, HENRY DAGGETT. *Orcharding.* New York, 1927.

GREEVES-CARPENTER, C. F. *The care of ornamental trees.* New York, 1928.

HAMBLIN, STEPHEN FRANCIS. *American rock gardens.* New York, 1929.

HARWOOD, WILLIAM SUMNER. *The New Earth; a recital of the triumphs of modern agriculture in America.* New York, 1907. (Given by Dr. J. H. Barnhart.)

HAYES, HERBERT KENDALL, & GARBER, RALPH JOHN. *Breeding crop plants* Ed. 2. New York, 1927.

HEDRICK, ULYSSES PRENTISS. *Peas of New York* Albany, 1928 (By exchange.)

HEDRICK, ULYSSES PRENTISS. *Systematic pomology.* New York, 1925.
JENKINS, PAUL BURRILL. *The book of Lake Geneva.* Chicago, ©1922.
JONES, HENRY ALBERT, & ROSA, JOSEPH TOOKER. *Truck crop plants.* New York, 1928.
LEHMANN, ERNST, ED. *Hugo de Vries. 6 Vorträge zur Feier seines 80. Geburtstages.* Stuttgart, 1929.
LLOYD, JOHN WILLIAM *Muskmelon production.* New York, 1928.
MCDOUGALL, WALTER BYRON. *Mushrooms; a handbook of edible and inedible species.* Boston, 1925. (Given by Dr. J. H. Barnhart.)
MARQUAND, ELEANOR CROSS. *Flora of Jekyl Island,* n.p. 1924.
MASON, ALBERT FREEMAN. *Spraying, dusting and fumigating of plants.* New York, 1928.
MASON, FRANCIS, ED. *Creation by evolution.* New York, 1928.
MEISEL, MAX. *A bibliography of American natural history: the pioneer century, 1769–1865.* Vol. 3. Brooklyn, 1929. (Given by Francis Keil & Son.)
MORROW, GEORGE ESPY, & HUNT, THOMAS FORSYTH. *Soils and crops of the farm.* New York, 1902. (Given by Dr. J. H. Barnhart.)
NOACK, KONARD LUDWIG. *Grundzüge der Botanik.* Stuttgart, 1929.
PARK, WILLIAM HALLOCK, & WILLIAMS, ANNA WESSELS. *Who's who among the microbes.* New York, ©1929. (Given by Dr. J. H. Barnhart.)
PRESTON, ISABELLA. *Garden lilies.* New York, 1929.
ROBERTS, EDITH ADELAIDE, & REHMANN, ELSA. *American plants for American gardens.* (Given by Mrs. N. L. Britton.)
ROBERTS, HERBERT FULLER. *Plant hybridization before Mendel.* Princeton, 1929.
ROCKWELL, FREDERICK FRYE. *Rock gardens.* New York, 1929.
RUSSELL, HARRY LUMAN. *Outlines of dairy bacteriology.* Ed. 5. Madison, 1902. (Given by Dr. J H. Barnhart.)
SALISBURY, RICHARD ANTHONY. *Prodromus stirpium in horto ad Chapel Allerton vigentium.* Londini, 1796. (Given by Mr. K. K. Mackenzie.)
SANDERSON, EZRA DWIGHT *Insect pests of farm, garden and orchard.* Ed. 2, revised and enlarged by Leonard Marion Peairs. New York, ©1921.
SCHAFFNER, JOHN HENRY. *Field manual of the flora of Ohio and adjacent territory.* Columbus, 1928.
SEYMOUR, ARTHUR BLISS. *Host index of the fungi of North America.* Cambridge, 1929.
SPRECHER VON BERNEGG, ANDREAS. *Tropische und subtropische Weltwirtschaftspflanzen.* Part 1. Stuttgart, 1929.
SWINGLE, DEANE BRET. *A text book of systematic botany.* New York, 1928.
TAYLOUR, HARRIET (OSGOOD). *Japanese gardens.* New York, 1929.
THOM, CHARLES, & CHURCH, MARGARET BROOKS. *The Aspergilli.* Baltimore, 1926.

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Bronx Park, New York City

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BRONX PARK, NEW YORK CITY

VOL. XXX SEPTEMBER, 1929 No. 357

JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

WILD PLANTS NEEDING PROTECTION
14. "Virginia Cowslip" or "Bluebells" (Mertensia virginica)

ELIZABETH G. BRITTON

DECORATIVE MIXED CONIFEROUS EVERGREEN COLLECTIONS IN THE NEW YORK BOTANICAL GARDEN

EDMUND H. FULLING

GIFT OF AN OLD MICROSCOPE

PUBLIC LECTURES DURING SEPTEMBER AND OCTOBER

NOTES, NEWS, AND COMMENT

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VIRGINIA COWSLIP or BLUEBELLS

Mert WSLIP or BLUEBELLS

JOURNAL
OF
The New York Botanical Garden

VOL. XXX SEPTEMBER, 1929 No. 357

WILD PLANTS NEEDING PROTECTION[1]

14. "VIRGINIA COWSLIP" OR "BLUEBELLS"
[MERTENSIA VIRGINICA (L.) DC.]

(*With plate* 304)

This is one of the most beautiful members of the Borage Family, which includes also the Forget-me nots and that attractively repellent weed, naturalized from Europe, the "Blueweed" or "Viper's Bugloss." The exquisite delicacy and grace of their pendent clusters of flowers and their dainty coloring, varying from pink in the bud to pale blue when fully opened, render this one of the most attractive of our American wild flowers. Their beauty has only recently begun to be appreciated and at last they have been discovered by our commercial dealers and the "fashionable, feminine landscape architects." This may spell their decimation or doom, for the commercial supplies all come from wild sources, and, as far as we know, no one has attempted, in the trade, to raise them from seed. Eight North American species of Mertensia have been described, ranging from Hudson Bay to Alaska, and in the Rocky Mountains from Colorado and Utah, south to Wyoming and New Mexico. Our eastern species occurs from Ontario to Minnesota, south to Nebraska and Kansas and seems to be more abundant in the Middle States, in Ohio, Illinois, and Indiana. Though fine illustrations, like the one accompanying this article, have been made from photographs taken in Pennsylvania, we know of only one station near New York City where

[1] Illustrated by the aid of the Stokes Fund for the Preservation of Native Plants. The last previous number (Jour. New York Bot. Gard. 23: 137, 138. *pl. 277.* 1922) of this series was erroneously numbered 14.

it grows in such abundance. It used to grow on the Orange Mountains near Montclair, New Jersey, but has long been gone from that locality. It prefers damp and shady places along streams and wet hillsides, and apparently seeds freely and grows readily from seed. If planted in shady moist places along streams or even in low swampy woodlands that are frequently overflowed in springtime, it will flourish and prove a permanent decorative feature.

It has a thickened storage rootstock which enables it to withstand ill treatment for a while, but it will ultimately dwindle and disappear if planted in uncongenial locations, or with unsuitable companions. If associated with tulips which have to be lifted and replaced each year, the Mertensias, if grouped around them, are sure to suffer and ultimately disappear. Their delicacy and charm are enhanced by natural surroundings and the ideal location is a shady bed of ferns, which gradually unfurl their fronds and hide the yellow and dying leaves of the "Bluebells." For *Mertensia virginica* blooms early, from March to May, and disappears entirely when the trees are in full leaf. The taller species, *M. paniculata* and *M. lanceolata,* bloom from June to August, but they also prefer thickets and woodlands and are entirely unsuited to sunny dry borders.

The flowers are clustered at the top of the stems, and have a tube with a lobed corolla, and a very short 5-parted calyx. The stamens also are free and inserted on the tube of the corolla. There are four round nutlets in each fruit.

Dr. Southwick has successfully established a group of them, brought from the colony on the Raritan River in New Jersey. They are planted in shade along one of the rills at the northern end of the Rock Garden, an ecological habitat much like their natural one

There are several exotic species, which are said to be "not easy to cultivate, but are offered by some American dealers" These are natives of Siberia and Kashmir and prefer high mountain districts, as do several of our Rocky Mountain species.

Elizabeth G. Britton.

DECORATIVE MIXED CONIFEROUS-EVERGREEN COLLECTIONS IN THE NEW YORK BOTANICAL GARDEN

In the "Guide to the Pinetum," recently published,[1] a somewhat detailed account is given of approximately two hundred and thirty-five different kinds of coniferous trees growing in the outdoor collections of The New York Botanical Garden. All the trees included in the Guide are arranged generically in groups. In addition to these, however, there are about a thousand coniferous trees that have been planted in mixed groups for decorative effects. These groups are analyzed in this supplement to the Guide with respect to the plants that occur in them. Little attempt is made to criticise the composition of these groups from an architectural viewpoint. The object in view, primarily, is to familiarize the reader with the names of these evergreens and to show their ornamental value as exhibited in the Garden.

No description of the trees is given but the many page references are to descriptions in the "Guide to the Pinetum." The Guide must, therefore, be used in connection with this account.

Two difficulties may be encountered in the analyses of these decorative groups. One is that plants are frequently removed from and others set in these plantings. The other is that it is not always possible to locate each individual plant exactly among many others. It is assumed, consequently, that the reader is at least somewhat acquainted with the coniferous trees; that he can readily recognize them as such and will be able to ignore the many deciduous and several broadleaf-evergreen shrubs which occur mixed with the conifers in the flower beds behind Conservatory Range 1 and in the Rock Garden. Elsewhere this difficulty will not occur. If confusion does occur the reader should proceed till he finds a tree which unquestionably fits the text and then work backwards. This should disclose any changes that have occurred since the preparation of this account.

In short:

1. This account is intended primarily for those somewhat familiar with the plants or who have studied the other collections

[1] Bulletin of The New York Botanical Garden, no. 51.

by means of the Guide. The Guide should be used in conjunction with it.

2. Only coniferous evergreens are mentioned; all other plants are ignored. This is particularly important in the flower-beds behind Conservatory Range 1 and in the Rock Garden.

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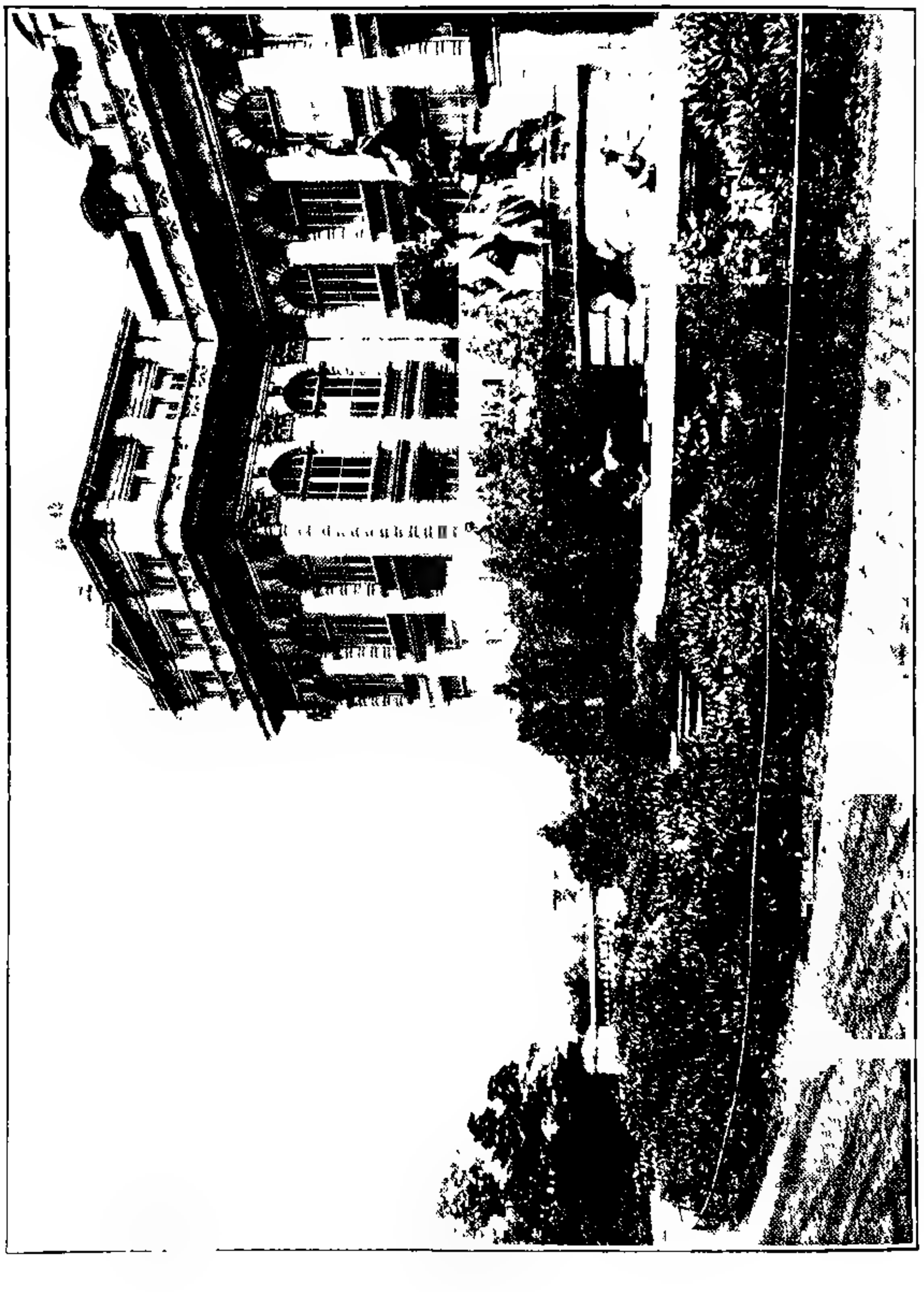
1. Upper Museum-Fountain

Surrounding the fountain directly in front of the Museum is an example of mixed evergreen planting that may effectively be used in such a situation. The most important landscaping principle embodied in this setting is the combination of tall coniferous evergreens in the background with showy flowering broadleaf-evergreens in the foreground. Such a combination is always pleasing, whether large or small, closely set or separated, as in this case, by the fountain itself.

All the tall evergreens in the background are Arbor Vitae (p. 125). Two of them represent the variety, White-tipped Arbor-Vitae (p. 129). This variety, known also as Queen Victoria Arbor-Vitae, is distinguishable from the others only in spring or early summer, when the tips of the foliage are whitish. It has no particular value other than its oddness. One of these trees is on the right-hand side approximately in the middle of the group and the other less noticeable tree is to the left of the fountain.

On the left side close to the water are three particularly fine evergreens that are worth special notice. The drooping one whose graceful branchlets dip into the water is a Weeping Hem-



Entrance to Upper Museum Mountain showing the handsome Weeping Hemlock

lock (p. 81). Its very attractive location here highly recommends its use by a water's edge and in spring, when clothed in its new clean bright-green foliage, it is a beautiful object. The other two taller and darker plants behind it, appearing almost as one and differing from the surrounding Arbor-Vitae, are Dwarf Hinoki-Cypresses (p. 92). This variety, too, is very handsome, having dense foliage of rich dark-green.

A few other trees stand on the left side, other than the Arbor-Vitae and the broadleaved evergreens. Two of them have light-yellowish foliage and represent an undetermined variety of the common Arbor-Vitae. Close to the wall at the extreme left are two White Cedars (p. 106), and one Red Cedar (p. 112).

On the right-hand side, close to the brick pillar supporting the flag pole, is an Arbor-Vitae. Behind it are three specimens of Golden Peabody Arbor-Vitae (p. 129) with bright yellow-tipped foliage in summer. To the left of these are two very light-green undetermined forms of Arbor Vitae.

The only remaining tree besides the common Arbor-Vitae on this side is one Spiral Arbor-Vitae (p. 129). It stands close to the wall behind the yellow forms and differs from the surrounding common Arbor-Vitae by its darker, more compact and seemingly twisted foliage.

All the broadleaved evergreens in the foreground are rhododendrons of several different kinds.

2. Lower Museum-Fountains

At the foot of the two roads leading up to the Museum are two fountains, one on each side of the main cross-road. At each end of the fountain area on the south side of the road are three Blue Colorado-Spruces (p. 59).

To consider the evergreens about the larger fountain structure nearer the Museum, we shall begin on the western side and proceed around it:

All the small trees along that side, twelve in number, extending a bit around the corner are Japanese Arbor-Vitae (p. 125). Around the corner, facing the Museum, are five trees conspicuously older than the others, having stouter trunks. Of these the second one in from the Museum drive is a Moss Retinospora (p. 92). The other four are Plumed Retinosporas (p. 93).

Beneath the two of these five nearest the drive is a small Golden Hinoki-Cypress (p. 100). Close to it and nearer the stone structure the taller tree is a Silver Red-Cedar (p. 111). Two more Japanese Arbor-Vitae are within the group and near the inner corner pillar of the wall. At this corner is another Silver Red-Cedar and the remaining five narrow columnar trees are Chinese Junipers (p. 110).

Across the intervening open space before us and on the other side of the fountain we find a continuation of this group. Close to the wall and roughly paralleling it, we should see four more Silver Red-Cedars. Facing the trees just as we come from the preceding group, we see a Chinese Juniper next to the corner Silver Red-Cedar, a Japanese Arbor-Vitae next to the left, and last on the left another Chinese Juniper. The low evergreen in front of all these is some form of juniper.

Proceeding slowly around the group to the left we pass two Golden Sawara Cypresses (p. 101) and then a fuzzy-foliaged Moss-Retinospora (p. 92). The three distinctly tallest trees in the group are Plumed Retinosporas (p. 93). Inside the group and to the right of the tallest of these three is a Golden Hinoki-Cypress (p. 100).

By the eastern road leading up to the Museum and near one of these three tall trees are three Chinese Junipers and two more Japanese Arbor-Vitae closer to the wall.

The remaining seven trees are in a row between the fountain wall and the road. They are, beginning nearest the Museum, one Golden Slender Hinoki-Cypress (p. 100), three Golden Hinoki-Cypresses (p. 100), one Golden Sawara-Cypress (p. 101), and lastly at the corner by the main road two more Golden Slender Hinoki-Cypresses.

On the east side of the east drive leading up to the Museum and near the main road are four tall conifers. They are Servian Spruces (p. 60).

On the west side of the west drive leading up to the Museum and close to the main road is a small group of evergreens. The semi-circular low mass of plants at the base is composed of twelve Pfitzer's Junipers (p. 110). The tallest tree in the group

nearest the fountain is a Plumed Retinospora (p. 93). Close to it, as we see it from the main road, are two smaller trees of about equal height. The right hand one with sparse foliage is a Thread Retinospora (p. 100), and the other bluish fuzzy one is a Moss Retinospora (p. 92). Directly in front of this last one is a very slender single-stemmed Japanese White-Pine (p. 15), to the left and right of which are three Silver Red-Cedars (p. 111).

The big heavier-foliaged tree at the western end is a Douglas-Fir (p. 88).

3. Long-Bridge Collection

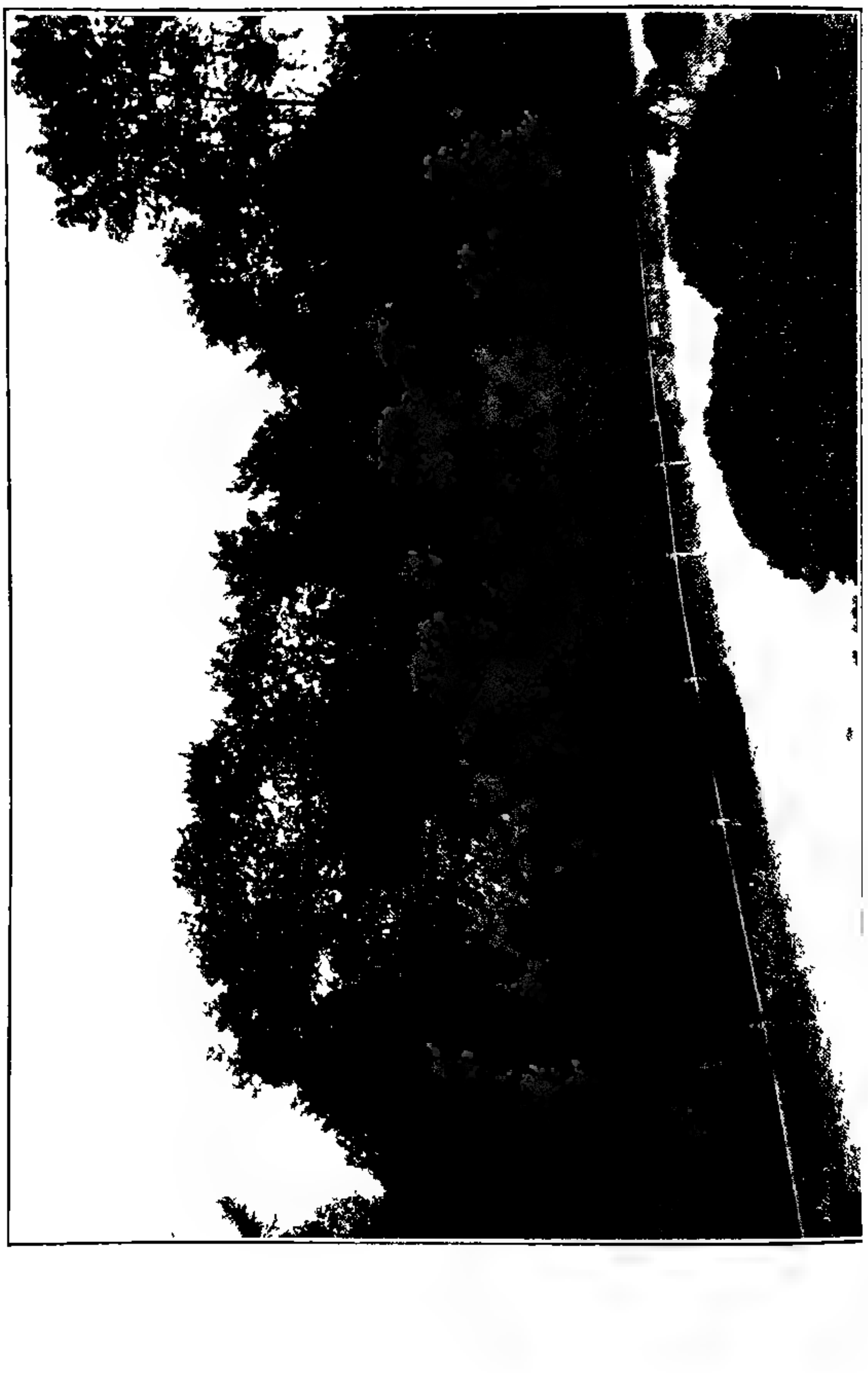
At the west end of the bridge that crosses the Bronx River near the lakes behind the Museum is a large and quite varied collection of evergreens. They make a very handsome group at this point and demonstrate well the value of these trees for such locations.

All the low stiff bushy evergreens between the road and path and several similar ones along the sloping walk leading to the lake are Mugho Pines (p. 44). The very dense droopy mass of evergreen along the main path and next to the Mugho Pines belongs to three plants of the Weeping Hemlock (p. 81). Just to the right of these is another single Mugho Pine and then the very broad dense yellowish mass with projecting branchlets is composed of four Variegated English-Yews (p. 143).

The eight or so trees with tufted foliage of five needles in a sheath that compose the next height class in this entire group are Swiss Stone-Pines (p. 13).

Among the remaining taller trees we should distinguish by their habit three distinct genera. First, there are several trees approximately in the center of the group whose horizontally projecting and somewhat upward-curving branches bear no foliage along their under sides. This feature is quite characteristic of firs and these six trees are Veitch's Firs (p. 73).

The second class to the left contains trees whose general habit, to a certain extent, is similar to that of the firs. The foliage, however, is dense and occurs below as well as above the branches. We cannot look through the trees so easily as in the case of the firs. These new ones are spruces, more specifically, White Spruces (p. 65).



The third class, with far-reaching branches of less uniform arrangement than in either the firs or spruces and having slender needles in groups of fives rather than scattered along the twigs, is composed of Eastern White-Pines (p. 17).

Behind the big clump of yew at the extreme right is a leaning Blue Colorado-Spruce (p. 59), guyed by wires. West of it is a White Spruce and in front of this a young Swiss Stone-Pine.

Let us go down the sloping path toward the lake and turn to the right. In doing so we pass half a dozen low dense Mugho Pines and two taller Swiss Stone-Pines. All the larger trees extending to the bend at the foot of the slope are White Spruces. Around the bend and with some of its outer branches hanging over the path is a deciduous star-leaved sweet gum. Behind it and filling this little area we see about twenty narrow pyramidal evergreens. They are White Cedars (p. 106). Some of these have distinctly yellowish foliage in summer and probably are var. *variegata*. Behind them are two big White Pines.

Let us now return up the inclined path, noticing on the way the evergreens on the other side. Closest to the walk are several more Mugho Pines and directly behind them we should notice by their yellow upward-projecting foliage two more Variegated English-Yews. Directly behind them the two taller evergreens with densely tufted needles, as well as two similar ones farther to the right, are Swiss Stone-Pines again. The more slender and more open tree that appears between the upper two of these four and behind the left-hand Variegated English-Yew is a Nordmann's Fir (p. 74). The tallest tree here, as well as two similar though smaller ones to the right of it, is a White Spruce.

Returning now to the upper main path and proceeding eastward, we see first a small Swiss Stone-Pine partially surrounded by the lower Mugho Pines. To the left of these latter the dark spreading evergreen is a Dwarf Japanese-Yew (p. 143). Beyond it the path is lined by more Mugho Pines.

Behind the Japanese Yew is that tallest White Spruce again. To the left of it is another White Spruce almost as tall and between them is a somewhat bluish-colored or glaucous tree. A very similar though slightly smaller tree stands more to the left before that second tall White Spruce. These two are Blue

Engelmann-Spruces (p. 62). The tree in front of these whose foliage is green above and whitish below is a Yezo Spruce (p. 64).

A few steps more to the left we spy a third Blue Engelmann-Spruce just behind the Mugho Pines. The tree behind it and incidentally to the left of the tall White Spruce is a Nordmann's Fir (p. 74).

Next left is a White Fir (p. 76) followed to the left by another and smaller tree of the same species. Then come three taller Nordmann's Firs in an arc.

The tallest tree to the extreme left, as well as its similar companions on its right, is a White Spruce again. Lastly the four similar trees with pendulous branchlets that stand on the slope behind the corner of the stone wall are Douglas Firs (p. 88). The smaller and greener tree just at the end of the wall and near the head of the descending trail is an undetermined species of spruce.

Let us go down that short trail and proceed to the right. At the corner we pass a small Douglas Fir. Then come two good-sized White Spruces along the path with similar ones behind them. Next along the path and half way up the slope are the three Nordmann's Firs already noted. Then comes a White Fir near the path behind which stands the tree of the same species that we noted from above. Next left is a Douglas Fir. Behind it to the right is the Nordmann's Fir and to the left the tall White Spruce, both of which were noted from above.

The next two smaller trees near the path are Yezo Spruces (p. 64). Close to the right-hand one and behind it is a taller Blue Engelmann-Spruce and behind the left-hand one is a White Spruce. The remaining small tree to the left of this last one is another Yezo Spruce. This species is not very hardy in the Garden and persists only when sheltered.

4. 204TH STREET STAIRWAY

At the north end of the Fruticetum, the area which contains the collection of shrubs, there is a high stone-wall and stairway on the western side. Against this wall and at one side of the stairway is quite a varied assortment of evergreens that from a little distance makes a very fine appearance.

Let us consider first the few at the foot of the stairs on their south side. The first one at the corner is a Golden Plumed-Retinospora (p. 94). A bit farther in is another and very similar specimen of the same kind and between them are five narrow trees whose foliage shows a distinct perpendicular arrangement and during the summer is conspicuously golden. They are Gold-spire Arbor-Vitae, *Thuja orientalis* var. *aurea conspicua,* a handsome variety of the Chinese Arbor-Vitae.

The large dark-foliaged conifer close by, bigger than any of the others, is an Austrian Pine (p. 31), a second one of which stands behind it and a bit to the left. There are two White Pines (p. 17) directly behind the first of these two Austrian Pines.

Close to the outer ivy-covered wall of the stairway, and concealed by the trees we have so far noted, are four more small evergreens in a row. The two middle ones, it should be observed, have a bluish foliage. They represent a variety of the Lawson Cypress (p. 105) and are known as *Chamaecyparis Lawsoniana* var. "*Triomphe de Boskoop.*" This variety very closely resembles and is indistinguishable from the Scarab Cypress (p. 105) which we shall soon see. The other two flanking them are *Chamaecyparis obtusa* var. *magnifica* (p. 102).

Now we shall consider the trees across the path and along the wall. The first green bushy one is a Compact Slender Hinoki-Cypress (p. 98). Then comes a taller beautiful bluish tree, the Scarab Cypress, just referred to.

We shall proceed along the path and disregard any concealed plants within the group, not distinctly noticeable from without. The next three tall and similar trees are Sawara Cypresses (p. 95). In front and beneath them are four distinctly different plants, three of which are similar to one another, while the fourth is taller with conspicuously drooping foliage. The three similar ones are Nootka Cypresses (p. 107) and the taller one is its drooping variety, the Blue Nootka-Cypress (p. 106).

The next tall tree along the path is a Golden Sawara Cypress. Then, almost concealed by it on the right-hand side, is a Golden Hinoki-Cypress (p 100). Very close by is a fuzzy bluish-foliaged tree which during early summer has a yellowish hue. It is the Sulphur-colored Moss-Retinospora (p. 94). In front of it,

a bit to the right and near the path, are two odd-looking greener plants. They are Clubmoss Retinosporas (p. 100).

Behind these and a bit to the right is another Blue Nootka-Cypress (p. 106) with grayish foliage and in back of this are two taller greener handsome trees. They are Lawson's Cypress (p. 105).

FIGURE 1 204th Street Collection: Chinese Arbor-Vitae, Blue Colorado Spruces, and several different kinds of Retinospora make a handsome group along this path, where they are protected from drying winds by the high wall behind them.

The next three trees in front of the taller of the cypresses are some form of Arbor-Vitae, whose exact identity has not yet been determined. There is another tree of the same sort a bit to the right, separated from the first three by a Compact Slender Hinoki-Cypress (p. 98) whose slightly darker color and broader habit distinguish it. In the very foreground, leaning onto the path, is some other undetermined form of Arbor-Vitae, while next to them, also lying on the path, is an Ellwanger's Arbor-Vitae[2] with

[2] See Conservatory Bed No. 5.

its two kinds of foliage. Above it are three pale yellowish-colored trees of still another undetermined variety of Arbor-Vitae.

All the tall trees behind these and a little to the right are Chinese Arbor-Vitae (p. 124). Below the right-hand ones, close to the path and next to those yellowish forms, is a Golden Thread-Retinospora (p. 94).

Next along the path is a large Variegated English-Yew (p. 143), close behind it is a White tipped Arbor-Vitae (p. 129) and next to the right are three more nicely shaped bushy Compact Slender Hinoki-Cypresses. Behind and above these the three closely set fuzzy bluish trees are Moss Retinosporas again and the tall green one whose top protrudes to the left of them is a Chinese Arbor-Vitae (p. 124).

The three tall yellowish trees also behind the Compact Slender Hinoki-Cypresses but to the right are Golden Plumed-Retinosporas. Under the right-hand one and close to the path the very small evergreen is a Golden Chinese Arbor-Vitae (p. 125).

Next, protruding a little over the path, are two more Variegated English-Yews with an opening and a trail between them. The tall bluish-needled trees behind both of these are Blue Colorado-Spruces. Mixed in with them are a few others. For instance, if we step along the path that goes through the group there is on the left, first a low stunted Nordmann's Fir (p. 74) and then a taller White Fir (p. 76), with a second stunted Nordmann's Fir to the left.

Next above the White Fir are two Blue Engelmann-Spruces (p. 62) and the other three tall trees surrounding the upper one are Blue Colorado-Spruces (p. 59).

On the right-hand side of the short trail as we entered it, is a Blue Colorado-Spruce followed by a Nordmann's Fir and then a Blue Engelmann-Spruce.

To consider the few remaining evergreens let us locate the large veteran Eastern White-Pine that stands prominently along the path beyond these smaller trees.

The first and foremost tree to the left of it is a White Spruce (p. 65). To the left of it is a taller Colorado Spruce (p. 61) and the trees behind are Douglas Firs (p. 88).

The thick-trunked tree with broad deciduous leaves in this group is a Sassafras.

5. Rock Garden

Just inside the fence at the entrance to the Rock Garden from Southern Boulevard, there are a few Swiss Stone-Pines (p. 13) on each side of the walk.

The large planting of evergreens on the right-hand side behind the five Swiss Stone-Pines consists of Red Pines (p. 40).

Figure 5. 204th Street Collection: Brilliant yellow Goldspire Arbor-Vitae make an attractive display in this setting.

On the left-hand side of the path by the corner where it branches to the left and extending along the left-hand branch, the evergreens behind the flower bed are White Firs (p. 76). They do not thrive well on this spot and make little growth.

Far to the right, along the path that extends in that direction, is a large planting of Douglas Firs (p. 88).

Let us consider the few scattered evergreens in the Rock Garden.

The distinct apex of the Rock Garden is directed toward us as we approach it and a grass walk extends through the center of the Garden. On the left-hand side of this walk, and near the path

which we shall follow around the Rock Garden, is the first small upright evergreen. It is some form of *Chamaecyparis.*

Twenty-five feet to the left is a fine plant of Pfitzer's Juniper (p. 110).

The next evergreens are some distance ahead behind the day-lily beds on the left side of the path. They form a long yellowish hedge behind the bed and are Variegated English-Yews (p. 143).

Proceeding north and turning right, we find two more Pfitzer's Junipers in the northwest corner of the Rock Garden. Just around the corner to the right, there is the northern end of the grass path already noted that passes through the Rock Garden. Let us enter upon it. On the left-hand side near its fork, half way up the slope, are half a dozen small Hemlocks (p. 83) and a couple of small White Pines (p. 17).

Let us follow the right-hand fork. The first evergreen on the right is a Pfitzer's Juniper (p. 110). Opposite, on the left side, are three more low evergreens close together. The right-hand one is another Pfitzer's Juniper, the left-hand one a Creeping Juniper (p. 118), and the middle one a Prostrate Juniper (p. 120).

Let us now climb up on top of the rocks behind these last evergreens and proceed south along the grass path. First on our right we should notice a White Pine, a Mugho Pine (p. 44), two Japanese Yews (p. 144)—four small plants close together.

About half way down the slope on the right, there is a very small upright compact conical evergreen only a foot high. It is *Picea canadensis* var. *conica.* This is one of the most interesting dwarf evergreens for Rock Gardens.

Along an adjoining path to the left we can see two Pfitzer's Junipers. At the southern apex of the Garden but on the eastern side of the grass path there is a relatively large Pitch Pine (p. 36). Still nearer the corner is a smaller plant of the same kind as stands opposite on the other side of the grass walk and with which we began to consider the evergreens in the Rock Garden.

6. Collection of Dwarf Trees and Shrubs

Directly east of the Rock Garden is a small collection of dwarf trees and shrubs, consisting of both coniferous and broad-leaf evergreens, as well as a few deciduous plants. We shall consider

them from the path that runs eastward from the drinking fountain.

The short low dense hedge along the path is composed of a dwarf variety of Privet secured under the name of *Ligustrum lodense* from a local nursery. It appears to be a very choice form, adaptable to many uses.

The more scattered and smaller plants to the right of it also along the railing are Truedwarf or Edging Box, *Buxus sempervirens* var. *suffruticosa.* This dwarf variety of box has been known for centuries and much used for edgings of flower beds.

Behind these plants the globose evergreen nearest the fountain is a Globe Arbor-Vitae (p. 124). To the left of it is one of the deciduous plants, Dwarf Cranberry-bush, *Viburnum Opulus* var. *nanum.*

Behind it the taller evergreen is a Compact Slender Hinoki-Cypress (p. 98). Behind this one to the right is a Dwarf Hinoki-Cypress (p. 92) and to the left a Weeping Hemlock (p. 81). Directly to the left of this last one is a Variegated English-Yew (p. 143) and to the left of this a Japanese Yew (p. 144).

Between and in front of these last two is another Weeping Hemlock, while behind them is a Japanese Umbrella-Pine (p. 23), flanked on each side by a deciduous Dwarf Indian Bean Tree, *Catalpa Catalpa* var. *nana.*

Directly in front of the last Weeping Hemlock is a Spreading English-Yew (p. 142). To the left of this and a trifle back is a Mugho Pine (p. 44).

Behind this Mugho Pine and directly to the left of that last Weeping Hemlock is a yellowish Sulphur-colored Plumed-Retinospora (p. 96). Behind this and to the left of the Dwarf Japanese-Yew is a Pfitzer's Chinese-Juniper (p. 110).

The two low very compact globular bluish-colored plants nearer the path are Compact Spreading-Retinosporas, *Chamaecyparis pisifera* var. *squarrosa compacta.* Behind them is another Dwarf Cranberry-bush. The remaining coniferous evergreen to the left is a Gregory's Norway-Spruce (p. 68) with a Dwarf Rhododendron, *Rhododendron catawbiense* var. *compactum,* in front of it.

7. Kipp's Corner

At the entrance into the Garden at the corner of Pelham Parkway and Southern Boulevard, known as Kipp's Corner, are several coniferous evergreens. They are in three groups, one to the right as one enters, another to the left and a third in a triangular plot between the foot paths to the left of the road after it enters the Garden. All these groups are inside the gate and should not be confused with the low evergreens at opposite corners outside the gate. These latter are broad-leaf evergreens, not conifers, and do not enter into consideration here.

Let us consider first those to the right as one enters. Facing the little group from the path that runs by them inside the grounds, the first one to the extreme right is a Dwarf Hinoki-Cypress (p. 92). To the left is another similar one and directly behind this second stands a third. The two taller trees surrounded by these three are Japanese Arbor-Vitae (p. 125). The third and last evergreen to the left along the path is a Golden English-Yew (p. 142). The remaining evergreen behind it is a Pyramidal Arbor-Vitae (p. 125).

On the other side of the entrance the first one to the left as we consider the trees from the path is a Spiral Arbor-Vitae (p. 129). Behind it along the stone wall are two Japanese Arbor-Vitae. Along the picket fence are three taller grayish-foliaged Silver Red-Cedars (p. 111).

The next evergreen to the right along the path is a Golden Peabody Arbor-Vitae (p. 129). Behind it stands a Japanese Arbor-Vitae and behind this a bit to the right is another Golden Peabody Arbor-Vitae.

The next bushy evergreen along the path is a Golden English-Yew and behind it stands a common Arbor-Vitae (p. 125). The last evergreen near the fence and next to the Silver Red-Cedars is a Siebold's Hemlock from Japan (p. 83).

The four handsome drooping evergreens in the triangular area between the paths are Weeping Hemlocks (p. 81).

8. Lilac-Garden Entrance

At the entrance into the Garden from Pelham Parkway near the lilac collection are several evergreens. All the trees that stand directly along the road on both sides include Plumed and

Golden Plumed-Retinosporas (p. 93, 94) differing only in the color of their foliage during early summer.

On the left-hand side as one enters from Pelham Parkway and behind the taller trees along the road are three bushy yellowish ones whose foliage closely resembles that of the Golden Plumed-Retinosporas. These three are Sulphur-colored Plumed-Retinosporas (p. 96). The other two narrower yellowish evergreens behind those along the road are also Golden Plumed-Retinosporas. And the last two bushy ones on this side of the road are Sulphur-colored Moss-Retinosporas (p. 94).

On the other side of the road there are four plants that differ from the Plumed Retinosporas. They stand farthest from the gate and are Compact Slender Hinoki-Cypresses (p. 98). On the inside of the path on this side of the road four of the evergreens are Golden Plumed-Retinosporas and the other two are Sawara Cypresses (p. 95). The latter include the second tree in from the gate and the one behind it.

(*To be continued.*)

EDMUND H. FULLING.

GIFT OF AN OLD MICROSCOPE

Mr. L. London, who has been for many years a dealer in machinery and tools at 2376 Third Avenue and is now retired, has recently given to The New York Botanical Garden an old horizontal microscope of unknown date. The machine bears a plate with an inscription "H. B. Hawker, New York," apparently referring to its manufacturer. As mounted, the instrument is five and a half feet long. Its barrel is a truncated eight-sided pyramid of wood, said to be mahogany. It is provided with rather crude ocular and objective and there is a third lens in the barrel near the objective. There are adjustments for focusing and for swinging the objective end of the barrel up and down and the ocular end right and left. The stage is a revolving disc having sixteen apertures of about the size of a ten-cent piece near its margin. In these apertures are pieces of glass bearing objects for study. The magnifying power is said to be about 25 diameters. There is a device that may have been used for attaching a light to illuminate the field, but it is probable that the machine

was usually pointed towards a window when in use. The donor bought the instrument from Gall and Lembke of New York many years ago.

PUBLIC LECTURES DURING SEPTEMBER AND OCTOBER

Free illustrated lectures on subjects of botanical and horticultural interest are given in the Museum Building of The New York Botanical Garden on Saturday afternoons during September and October, beginning at four o'clock. Doors are opened at 4:15 to admit late-comers. The program follows:

Sept. 7. "How to Arrange Gladiolus," Max Schling, Florist.

Sept. 7. Afternoon, and Sept. 8, all day, Gladiolus Exhibition of the Metropolitan Gladiolus Society, Museum Building, and Gladiolus outdoor display at Horticultural Grounds.

Sept. 14. "Plant Cancers and How They Differ from Those of Animals," Dr. Michael Levine, Biologist at Montefiore Hospital.

Sept. 21. "Overcoming Difficulties in Plant Propagation," Dr. Wm. Crocker, Director, Boyce Thompson Institute for Plant Research.

Sept. 28. "Dahlias,"
Dr. Marshall A. Howe, Acting Director-in Chief.
Exhibition of Living Dahlias.

Oct. 5. "Bulbs in Mixed Plantings," Mrs. Wheeler H. Peckham, Honorary Curator of Iris and Narcissus Collections.

Oct. 12. "Autumn Coloration,"
Dr. A. B. Stout, Director of Laboratories.

Oct. 19. "The Westchester County Parks," Mr. Hermann W. Merkel, General Superintendent of Parks.

Oct. 26. "Australia, Past and Present," Dr. Arthur Hollick, Paleobotanist, and Dr. Forman T. McLean, Supervisor of Public Education.

NOTES, NEWS AND COMMENT

Dr. Earl E. Sherff, Professor of Botany in the Chicago Normal College, spent a week at The New York Botanical Garden in August, engaged in systematic studies of certain genera of the Compositae.

Dr. John K. Small, Head Curator, left New York on August 18 for a three weeks' visit to Florida and the Gulf States, for the special purpose of continuing his studies of the genus Iris, certain palms, and other southern plants.

Dr. A. B. Stout, of the Garden staff, spent the greater part of August in Maine in further studies of hybrid poplars and of the forestation work being developed in coöperation with the Oxford Paper Company. Mr. E. J. Schreiner, a registered student of the Garden, has been in Maine for this work throughout July and August.

By the combined efforts of the University of Kentucky and the Lexington Garden Club, the University of Kentucky Botanic Gardens, comprising about nine acres of land near Lexington, Ky., are approaching completion. It is the ultimate aim to have in the garden every kind of plant that will flourish in that climate. A rock garden, an aquatic and bog garden, and a special planting of rhododendrons are features of the present development. It is hoped that eventually a larger tract of land will be added, sufficient for the establishment of an arboretum.

In spite of the three months' drought, the Dahlia Border which this year includes 1,050 plants, representing about 400 varieties, is in fairly good condition and promises to give an attractive and interesting display of flowers during September and October. Many of the newer varieties originated by Broomall, W. H. Waite, Fisher and Masson, Bessie Boston, Seltsam, Success Dahlia Gardens, W. Atlee Burpee Company, James Smith, Alling Cottam, Stillman, etc., are shown. The Rose Garden, much of which occupies low ground, is in a vigorous state and continues to show many flowers.

Mrs. C. Albert Schwab, of the Federated Garden Clubs of New York State, gave an illustrated lecture on "Landscaping Your Own Garden" on Saturday, May 18, at The New York Botanical Garden. Mrs. Schwab is keenly interested in the development of good garden design and planting among the small-garden owners who supervise or do their own work and the lecture was given with the special needs of these people in mind. "Landscaping Your Own Garden" consists of making the most of the possibilities of your own home grounds, whether it is an estate or a city back-yard. On large estates you have trees, groups of shrubs and a vista, generally a long and beautiful sweep of lawns, curving driveways, and a well-screened service-section. The last is most important. That feature, well planned, remains an asset and practical; badly placed, you are always wanting to change it. The original layout of large places is best left to a landscape architect, never to a nurseryman who wants to sell trees and shrubs. The larger the place, the more you use the long perennial border and broad sweeps of color. Plant seven and nine or nineteen of a thing instead of the group of three plants acceptable in the small border; make use of tall and bolder grouping of your plants; and put in an occasional shrub to break up the length of such a border. When you come to the small place with garden, you consider every aspect before planting. The formal garden uses every bit of space carefully. A landscape architect should consult with your architect before placing the house, so as to make the most of your location and have few vain regrets afterwards. The smaller the place, the more formal it should be. The lecture was illustrated by ninety colored slides of gardens in New York, Connecticut, Massachusetts, New Mexico, Florida, and California, showing the use of plant material for landscape effect in and around the home garden. The Carillon Tower at Mountain Lake Park, Florida, and the bird sanctuary recently opened to the public there by Edward Bok were shown, as well as the long-established Middleton Place Gardens of Charleston, South Carolina.

An illustrated lecture on "Wild Flower Preservation" was given at The New York Botanical Garden on the afternoon of Saturday, May 11, by P. L. Ricker, President of the National

Wild Flower Preservation Society. He stated that while the principal causes of the scarcity of many of our attractive wild flowers are fires and real-estate and agricultural development, flower lovers in all parts of the country are contributing extensively to the destruction of the comparatively few attractive flowers remaining in most localities. Most of this destruction takes place in the spring when nearly everyone who can goes on week-end trips to the suburban and country districts. Thousands of others are ordering for their gardens roots of rare wild flowers from plant collectors, who in many cases are not leaving a sufficient number of plants on their collecting ground to replenish the local supply. Unless carefully guarded wild-life preserves are established in every state for the protection of local flowers, birds, and game, many of them will soon be classed with the passenger pigeon and the buffalo. About 100 attractively colored lantern slides were shown, many of them being scenes from one of the best protected of eastern sanctuaries, and included the beautiful Magnolia-like flower Franklinia, named for Benjamin Franklin, which is probably exterminated in the wild state in this country and is very rare in cultivation; the Snow Plant, known chiefly from the Yosemite National Park region, for picking which there is a $25 fine; and the attractive Silver Sword, known only from within the craters of a few Hawaiian volcanoes and which until recently was being rapidly destroyed by goats and native collectors. The increase of the supply of attractive wild-flowers by planting carefully collected seed in plant preserves and in the home garden was urged as one of the best means of solving the problem. Methods of overcoming delayed germination of most native wild seed were described.

Meteorology for August: The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: 86° on the 11th; *93° on the 12th*; and 89° on the 24th and the 25th. The minimum temperatures recorded were: 55° on the 5th; 57° on the 8th; 55° on the 17th; *52° on the 21st;* and 55° on the 31st. The total precipitation for the month was 1.52 inches.

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GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of narcissi, daffodils, tulips, irises, peonies, roses, lilies, water-lilies, gladioli, dahlias, and chrysanthemums; in the winter displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than one million specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 38,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural, and forestal subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————

All requests for further information should be sent to

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THE FIRST SHOW OF THE METROPOLITAN GLADIOLUS SOCIETY

The first show of the newly organized Metropolitan Gladiolus Society, held in the Museum Building of The New York Botanical Garden, September 7 and 8, was well attended and attracted flower enthusiasts from all over the suburban area of New York City as well as more distant points. Visitors came in numbers from Westchester and Rockland Counties, Long Island, Staten Island, Connecticut, and northern New Jersey, while a few came from up-state and more distant points. One gladiolus enthusiast from Florida and another from California were industriously noting down their preferences along with the local " fans."

The exhibits comprised a varied and interesting assortment of gladiolus varieties, the newest of American creations, and imported titled aristocrats —*King George, Sir Karl,* and *Duchess of York* —mingled most amicably with the celebrities of yesteryear—*Jenny Lind, Fern Kyle,* and *Charles Dickens.* An appropriate urban touch was given in *Wall Street,* a golden Primulinus variety, and *Fifth Avenue,* another richly colored and larger-flowered novelty. These were shown by John Scheepers, who won the American Gladiolus Society silver medal for the most artistic display of gladiolus. His exhibit included also handsome spikes of the odd smoky *John T. Pirie, Saraband,* and white-throated Australian *Hinemoa,* an outstanding vase of the big showy pink *Mr. W. H. Phipps,* and about forty other varieties which were grown for him in New Hampshire and shipped down for the show.

Two of the outstanding features of the show were insular. Mrs. Courtlandt D. Barnes, winner of the Stumpp & Walter silver cup for the amateur winner of the greatest number of first

prizes and of the American Gladiolus Society silver medal for the best three spikes in the show, sent in her blooms from Manhasset, from drouth-swept Long Island. Her gardener, Donald Leech, certainly did an artistic job of growing, for *Golden Measure* has not been so well shown for a decade as Mrs. Barnes had it at The New York Botanical Garden on Saturday. Her *Evelyn Kirtland* was likewise prime, and the three spikes of *Purple Glory*,

FIGURE 1. A part of the display at the first show of The Metropolitan Gladiolus Society.

which won an American Gladiolus Society bronze medal for the best three spikes in the show would be hard to surpass, even in that superb exhibition variety. The other island winner, Mr. Neil F MacDonald, of West Brighton, Staten Island, who won the American Gladiolus Society sweepstakes for the greatest number of prize points, also brought in superb blooms and a great assortment of varieties, which he entered in the strongest competition, both in the open and in the amateur classes. As an amateur,

growing his flowers in a city backyard, it is little short of marvelous what a yield of blooms he gets from a small space by judicious culture, watering, and fertilizer; for this is not his only winning of the year. He also exhibited successfully at Cape May in July, at the Staten Island Horticultural Society Show, and at the American Gladiolus Society Show at Springfield, Illinois, in August. His tall spike of the new Australian yellow *Canberra* was but one of a score or more interesting new varieties shown by this Staten Island fancier.

The best spike in the show was awarded to the variety *Mrs. Leon Douglas,* a giant salmon-pink, shown by Mr. Norman Lindop, of Firthcliffe Gardens, Pearl River, New York. The variety is a constant winner, and the spike of it shown by Mr. Lindop was an excellent one in every respect. Mr. Lindop also won first prize for the finest display of the newer varieties, with a remarkable showing of more than sixty kinds, covering the whole broad range of coloring in gladiolus, from *Purest White, White Pearl,* and *Albatross;* salmon pink *Cara Mia, Pearl of California, Mrs. P. W. Sisson,* and *Annie Laurie;* lavender *Minuet, Berty Snow,* and *Jap Lady; Kirchoff's Violet, Veilchenblau,* and *Aida* in the violet shades; pink *Matariki* from New Zealand; red *La Gaieté* and *Sir Karl;* red-blotched creamy *Odalisque,* yellow *Norma Talmadge,* and many others. There were two other fine exhibits of novelties by John Scheepers and Neil F. MacDonald, and most of the outstanding novelties both American and foreign, were represented in one or the other of these three comprehensive exhibits.

The American Gladiolus Society bronze medal for the best display of fifteen spikes of Primulinus varieties was won by Mr. Neil F. MacDonald with an interesting assortment of wee little hooded prims.

The garden club competition for the most artistic basket of flowers, gladiolus predominating, called forth interesting and tasteful designs by each of the three competitors, and it was difficult to assign the awards. The Horticultural Society of Staten Island put up a fine arrangement of the Primulinus *White Butterfly* on a green foundation, winning first premium. The Wayside Garden Club of Scarsdale showed how to use gladiolus effectively in combinations of colors, with other flowers, cream, salmon, and pale pink Primulinus gladiolus being grouped effectively with blue

heliotrope and Ageratum and red leaves of flowering Prunus. The result was a warm, bright basket in which the gladiolus served as the high note. The New Rochelle Garden Club basket struck a still bolder note, large salmon-pink *Mrs. Leon Douglas* and ruffled *Pride of Lancaster* gladiolus being combined with dahlias and green and white variegated *Snow-on-the-Mountain.* All three baskets demonstrated in varying degrees the modern tendency to use gladiolus flowers in pleasant combinations with other flowers and foliage, rather than alone. These and the other artistic displays, together with Max Schling's demonstration of gladiolus arrangements in vases, bowls, and bride's and bridesmaid bouquets, which were exhibited on the second day of the show, gave the visitors an excellent chance to see how effectively the gladiolus may be fitted into any scheme of decoration.

Miss D. M. Barnett, of Newburgh, New York, was awarded the first prize for display covering one hundred square feet and showed herself a true business woman by emphasizing in her exhibit such sturdy reliable varieties as *Marshal Foch, Jenny Lind, Mary Pickford, Mrs. Laura S. Schweppe, Dorrit,* and *Twilight.*

In the table decorations, Miss Adele Burcher, of Scarsdale, won first with a bowl of pale-pink *Jenny Lind* gladiolus tips in a vase with light blue Ageratum. Mrs. Franklin M. Jones took second with a somewhat taller combination of *Alice Tiplady* and a small yellow Prim combined with pink and pale-blue small-flowered hardy asters, blue pansies, and marigolds in a deep blue bowl.

The flower arrangement for a small table was won by Mr. N. F. MacDonald, as was also the third prize award for luncheon-table decoration. His use of Queen Anne's Lace to combine with small prims suggests an interesting use for this lowly roadside weed. Queen Anne's Lace would be cherished and admired for its real beauty if its over-abundance of vigor did not make it hard to suppress in the garden or outside.

In the open competitive classes for gladiolus arranged by color groups, Mr. Henry C. Wylie, of New York and Amawalk, Mr. Norman Lindop, of Pearl River, New York, and Mr. Alfred J. Kroll, in charge of the gardens of the Resor Estate, Greenwich, Connecticut, were conspicuous winners, all of them showing well-grown blooms.

In the amateur classes, Mrs. Courtlandt D. Barnes, Mr. Neil F. MacDonald, Mr. Charles A. Robinson, of East Orange, New Jer-

sey, and Mr. Harry F. Page, of Cranford, New Jersey, divided the honors. Mrs. Barnes's flowers all were splendidly grown, with long, thrifty spikes, carrying a maximum number of blooms. Mr. MacDonald and Mr. Robinson vied with one another in showing new and uncommon varieties in the one-spike classes. Thus in the whites, *Angela, White Pearl, Wm. Kent, Mrs. F. C. Hornberger,* and *Idamae* were in competition. In the yellows, old *Golden Measure* won over the newer *Canberra* and *Sydney Plummer,* but Mrs. Barnes's gardener, Mr. Donald Leech, put up an exceptionally fine spike of *Golden Measure.* In the pinks and salmon pinks, *Giant Nymph* and *Evelyn Kirtland* won as usual, but *Catherine Coleman, Immensity, Kiva, Mrs. Knowlton, Dr. D. A. Mills,* and *Highland Laddie* added to the collector's interest in the class. In the lavender, violet, and purples, *Indian Summer* and *Charles Dickens* both won over *Minuet.* Both lavender-pink *Indian Summer* and purple *Charles Dickens* are good growers and promising gladiolus. In the reds, the winning varieties, *Pythia* and *Dr F. E. Bennett,* are well enough known, but glistening *Red Splendor,* with its heavy ruffled petals also won a prize-winning place, though the spike was short, and *J. N. Kelway,* a crimson resembling *War,* also looked promising.

In the smoky class, old *Rose Ash, Desdemona,* and *Bengal Tiger* were the entrants, though elsewhere in the hall were fine spikes of *Saraband, Hinemoa,* and other worthy contenders in this class for dusky oriental tints.

In the classes for other garden flowers garden-club members were conspicuous winners: Mrs. Jerome Coombs, of Scarsdale and Bronxville; Mrs. Franklin M. Jones, of New Rochelle, and Miss Nellie Kuh, of New Rochelle. Mr. Alfred J. Kroll, of the Resor Estate, Greenwich, Connecticut, won first for hardy perennials, a second for annuals, and received two other special first prize awards for fine pots of lilies.

In the children's classes, Jean A. and Janet B. MacDonald proved worthy offspring of their parents, winning two prizes each.

The endurance test brought some varied entries, among which three spikes of *Imperator* shown by Charles G. Gillman, of Hicksville, Long Island, finished the second day in the best condition. The grievous drouth that visited that garden spot these past three months seemed to reënforce the keeping qualities of the gladiolus blooms that weathered through.

A special exhibit of three huge blooms of dahlias of the variety Marmion aroused frequent comment.

To add to the general interest of the show, Max Schling, who gave an instructive and entertaining lecture and demonstration of flower arrangements, also sent in a number of unusual flower heads of a hybrid ginger, *Zingiber Darceyi,* a tropical kind of ginger-root seldom seen in flower in the north.

As a first show of a new society six months old, the Metropolitan Gladiolus Show may be counted a distinct success. The outdoor display beds of gladiolus, containing 800 varieties, the majority of which were in bloom at the show time, added to the interest aroused by the hundreds of varieties competing for recognition on the show benches.

Sincere thanks are due to the many people who contributed to the success of the show. The New York Botanical Garden not only provided a hall for it, but also cared for the transportation of vases and tables, loaned the services of Mr. H. W. Becker as show manager and of Mr. Boynton as judge, and gave a luncheon for the judges and officers on the opening day of the show. The Horticultural Society of New York loaned us vases and tables admirably suited to our needs, and in addition to this Mrs. Elizabeth Peterson, Recording Secretary of the Horticultural Society, gave us her services and those of her assistant, Miss Goodbody, during the entire first day of the show Mrs. Peterson took charge of the entries and records, making these on forms furnished by the Horticultural Society of New York and according to the system worked out for the International Flower Show. Since only three of the many entries were made previous to the day of the show, this work was both arduous and difficult. It was due entirely to her work that the records were complete and accurate to the last detail at the opening of the second day of the show. The judges, Mr. Kenneth R. Boynton, Professor J. H. Clark, Mr. A. C. McLean, and Mr. Leo E. Miller also gave their services freely and deserve our heartfelt thanks. The cup donated by Stumpp & Walter, and the gold medal, two silver medals, and three bronze medals from the American Gladiolus Society as prizes called forth lively competition, and the Metropolitan Gladiolus Society extends its thanks to both of these contributors.

FORMAN T. MCLEAN.

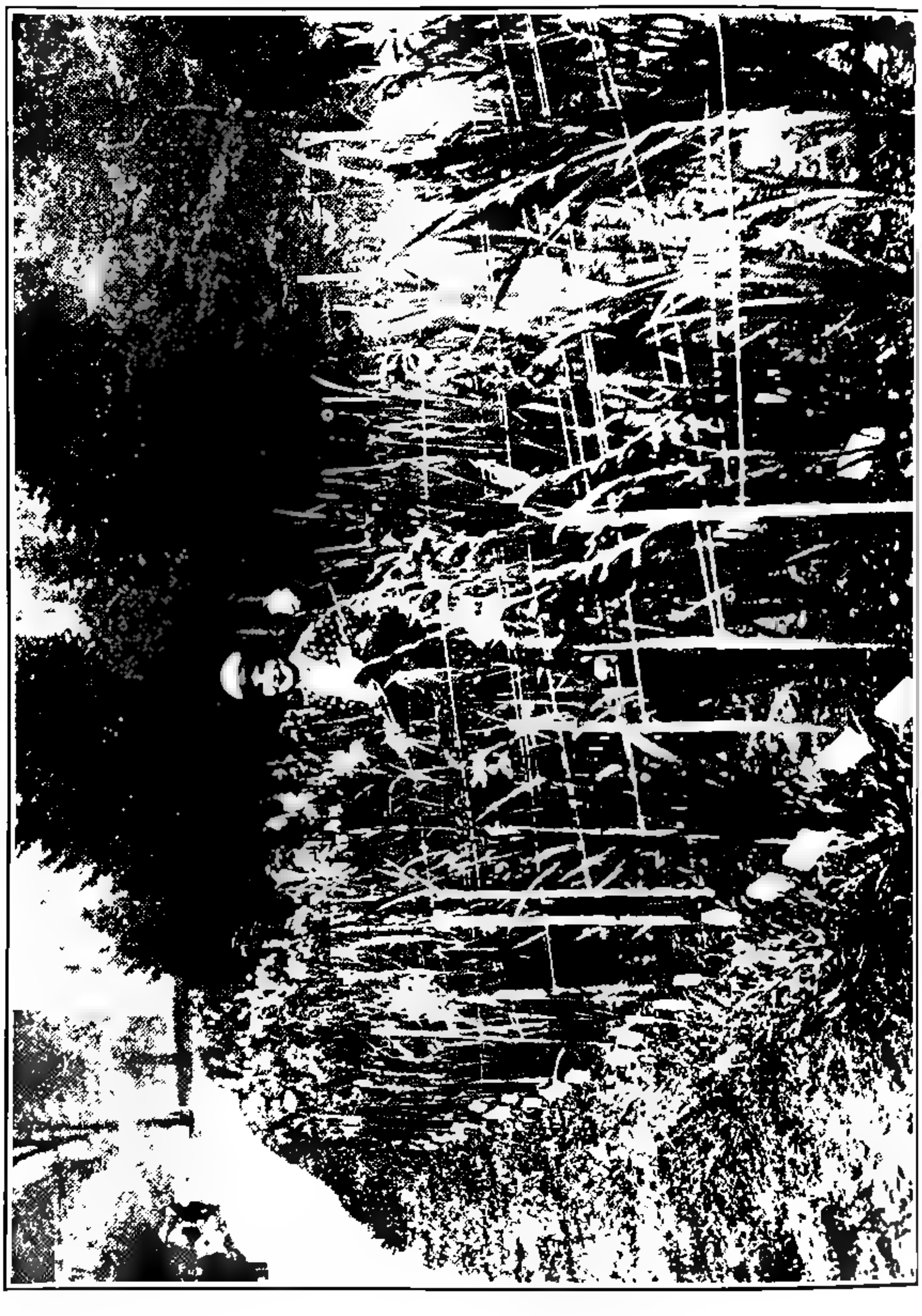
GLADIOLUS DISPLAY AT THE HORTICULTURAL GROUNDS

The gladiolus plantings in the beds at the Horticultural Grounds of The New York Botanical Garden, following the Darwin tulips, were made in time to bloom the first week in September. The recent rains have benefited them, and now (September 9) they are about at their height, with 220 varieties blossoming in the variety bed in which 800 sorts are planted singly or in twos or threes in alphabetical order. A more extensive planting opposite these, next to the Douglas-Fir War-Memorial Plantation, is arranged in color groups; red, pink, salmon-pink and orange, yellow and cream, white, lavender, violet, purple, and smoky shades being planted in succession from the top to the foot of the hill. A small bed adjoining the naturalized narcissus in the triangle is made up entirely of the graceful little hooded Primulinus hybrids. These make a specially bright showing, and have continued in good form for the past three weeks, for the Primulinus varieties are free bloomers and are the most suitable gladiolus for outdoor bedding effects.

The interest of visitors seems about equally divided between the bold, showy large-flowered sorts, the small, slender more graceful types, the ruffled and lacinated varieties, like *Golden Frills,* the Glories (*Purple Glory, Red Glory, White Glory, Golden Glory,* etc.), *White Orchid,* salmon pink *Honeydew,* and smoky rose *Lacinatus.*

The heat and drouth of the summer, with the succeeding heat and humidity of early September, has tried the endurance of all varieties of gladiolus this season, causing several of them to grow deformed, with the flowers badly placed or the spikes bent over and crooked. So it is easy to pick out the sturdy ones, and to pick the faults in the weaker kinds.

Among the recent novelties, *Aflame* proves to be a strong, robust giant-flowered Primulinus hybrid, bright red, flaked with crimson near the edges of the segments. *Berty Snow* from Scotland is a clear pale lavender, with rather shorter spikes this season than normal. Perhaps it resents the drouth. *Blenn* is a pretty ruffled pink of moderate size. *Dr. Neeley* is an agreeable pale flesh-pink, nearly white, with rounded blooms characteristic of



many others of Kunderd's introduction. *Dr. Crist Martz* is a ruffled bright scarlet. *Jubilee* is a sensationally large vinaceous lavender, and appears to be a good grower for so large a flower. *Miss Philadelphia* is quite appropriately a mild, pink-tinted white, of good size. *Oran,* though not specially new, has distinct merit, being a bright orange *Primulinus grandiflorus,* of the same color as *Orange Queen,* but much larger and longer. *Paul Pfitzer* is a tall, robust large-flowered, slightly ruffled purple, reminding one of *Purple Glory* in form and stature, but of a rich purple color. *Pfitzer's Triumph* continues to give a good account of itself with short spikes, and few flowers open at a time. But these are of large size and last reasonably well as cut flowers, though they wilt badly in the hot sun. *Red Glory* is a rich red color-mutant of *Purple Glory,* with a good color—and all of the other faults and virtues of the original variety. *Radiant Orange* has a brilliant coloring, but short spikes and only moderately strong growth. *Saraband* behaves as well in the field as in the show room, being a tall, vigorous grower, with well formed smoky brownish red blooms; decidedly worth while among the dusky sorts. *Veilchenblau* still gives a reasonable accout of itself, with good blooms and medium-sized spikes. These mark it as somewhat superior to most of the so-called blue varieties, which are apt to be weak growers and prone to disease. *Heavenly Blue* has proved weak-stemmed here this year, and the flowers fade out from pale blue to nearly white, both in the field and indoors, while *Mrs. Van Konynenberg* continues to show very bad placement of its erect, narrow blooms on its tall spikes. In the Vaughan consignment, *Virginal* proves to be a pure white, with good sized bell-shaped blooms, several of them open at once. *Edith Mason* is a clear light pink, with cream throat and good-sized blooms. *Martha Phillips* is a rich maroon, interesting for its color. *Vaughan's White* is short and stubby this season, which is unusual for it.

In the color beds, *Heinrich Kanzleiter* and *Negerfurst* are both dark-maroon reds, as dark or darker than *Purple Glory,* both of good size and form. The former is perhaps the clearer color. *Red Fire* seems not to be fiery at all—rather a deep crimson resembling *War* in color and *Scarlet Wonder* in form. *Tommy Atkins* proved to be a tall, robust *Primulinus grandiflorus,* with graceful carriage and wide-open rounded red blooms of moderate

substance and size. In the salmon pinks *Giant Nymph* continues to be a good grower and bloomer. Both in wet seasons and dry its tall graceful spikes and large, open flowers are always conspicuous in the garden as they are in the showroom. *Herodian* and *Lavinia* from Australia both prove rather disappointing, with large erect rather tubular flowers of flaky pink colors. In contrast to these *Llewellyn* makes a sturdy spike of wide-open bright pink blooms, ruffled and apparently of good substance as well. *Gladdy Boy* from Bill proves to be rather a flame-orange *Primulinus grandiflorus* than a large-flowered pink. It has wide-open ruffled and pointed-petalled flowers, carried on tall, slender, graceful stems. *Peach Rose* continues to attract notice because of its bright rose-pink blooms. *Pink Edge* also attracts because of its color—a somewhat flaky white, with a strong picotée edging of rose-pink. *Pride of Portland* really belongs in the red class rather than orange. Its striking orange-scarlet coloring and clear white throat atone for its rather short stem this season. In contrast to it, *Sweet Rose* is an exceptionally robust deep rosy salmon-pink, with good-sized flowers, well placed.

Cara Mia has such a bright clear pink color that it will be popular, whether it ever attains show size or not. So will *Gay Hussar,* a bright orange-salmon. *Señorita* from Salbach has large size, an agreeable irregular form, with flaring quilled petals, and a bright orange-yellow color. It is an interesting novelty as well as a good show variety. *Copper Bronze* is a prettily colored Prim that properly belongs in the smoky class, being coppery-orange, splashed bronze-purple. Though short, slender, and retiring, its color aroused much comment.

In the yellows there are a few new ones of merit. *Grand Guardian* from Austin is an upstanding ruffled rich golden blossom, with a faint brownish-lake blotch. *Ruffled Gold* is a paler color and smaller, the flowers having frilled edges. It is a tall grower and a worth-while variety. *Betty Darnell* is a lemon-yellow with many medium-sized, rather tubular flowers open at once. It makes a well-stocked spike.

White varieties aroused considerable comment, and there were some disappointments, for instance, *Memory of Wm. Pfitzer,* which has appeared so well in the shows, proved to have the blossoms frequently placed opposite one another on the spike, this one

fault outweighing its merits of size, purity of color, and florifer-ousness. *Mary o'Mine* seems a good large white, not quite so wide open but without the colored blotch of *Joerg's White*. *Mrs. F. C. Hornberger* is taller than either, and prettily ruffled, but not so large-flowered. *Milady Imogene* is a dainty little bloom in a class by itself—a ruffled, clear white, with many blooms open on a slender graceful spike—an attractive if not a showy flower, and admirable for decorative use. *Mulhouse,* a prettily ruffled flesh-white, is of pleasing color and form but irregular placement this year, its erect blooms appearing on all sides of the stalk. In the light pinkish lavenders, *Dr. Moody* and *Jane Addams* contest for place with *Minuet*. *Dr. Moody* is a tall grower, with many open blooms, and *Jane Addams* is darker, more pink in color than *Minuet,* but the latter is still hardly surpassed in its color class.

Mary Frey is a big handsome lavender, colored like *Mrs. F. C. Peters,* but it developed a weak neck this year. In the violet class *Aida* looks promising. *Sovereign* is a richer, more intense violet-purple, but is scarcely larger than old *Baron Joseph Hulot*. *Betty Bales* is an interesting little gray violet, with wide-open star-like erect blooms—an interesting novelty.

In the smoky class, *Saraband* and smoke-gray *Marmora* reign supreme, though *Chameleon, Copper Bronze,* and *London Smoke* all have interesting colorings.

If one wants a deep brownish-maroon, *Gettysburg* has that color, and *Montenegro* is another, almost black.

Among the Prims, the color range is as wide now as in the large-flowered types. *Gregor Mendel, Taurus,* and *E. B. Williamson* are different shades of purple, from dark to light. In bright red, *Scarlet Beauty* and *Scarlet Bedder* are both brilliant. In orange, *Orange Queen* is still first class, while in orange yellow, tall slender *Ethelyn* and shorter, more compact *Buddy Worden* are both interesting. *Golden Amber* is similar to *Ethelyn*, but paler-colored.

These are but a few of the notes made on the collection, which made a good display of gladiolus varieties for comparison throughout the month of September.

FORMAN T. MCLEAN.

DECORATIVE MIXED CONIFEROUS-EVERGREEN COLLECTIONS IN THE NEW YORK BOTANICAL GARDEN

(*Continued from page 228*)

9. Rose Garden

Grouped about the stone stairway that leads into the Rose Garden from the road is a very fine group of decorative evergreens that exemplifies well the ornamental value of conifers. They are here used as a frame for an architectural feature and, as it were, they tie the stairway to the surrounding ground, making it blend into its location, rather than allowing it to stand out too strikingly.

On the higher ground in the oval plot between the top of the stairway and the road are nine conifers. The three larger flat-topped ones are Dwarf Japanese-Yews (p. 143[3]). The other four smaller ones between these three and the road are Spreading English-Yews (p. 142). It should be noted how the dense foliage of this latter variety droops while that of the other points upward.

Now we shall consider the plants along the sides of the stairway, beginning with those on the south or right-hand side as we face the Rose Garden. At the top of the stairs the first three bushes[4] in a group are Sulphur-colored Plumed-Retinosporas (p. 96). These three shrubs exhibit a reversion (p. 96) in parts of their foliage to that of the next three plants close to the stone railing going down the slope. These latter are Golden Plumed-Retinosporas. Both of these forms are conspicuously yellow in summer. Below the last of these, but not close to the stairway, is a plant of similar foliage except that it is green and not yellow. It is the plain Plumed Retinospora (p. 93).

[3] Page references are to "Guide to the Pinetum" (Bull. N. Y. Bot. Gard. no. 51), where descriptions may be found.

[4] These are mentioned as a starting point because of convenience. There are, however, four other evergreens about six feet south of them along the upper path. The low green one nearest the path, consisting of three or four spreading branches, is Pfitzer's Chinese-Juniper (p. 110). Next to it, in from the path, is a Golden Plumed Retinospora (p. 94) Directly behind it is a plain Plumed-Retinospora and to the right of this latter is another Golden Plumed-Retinospora.

Bordering the lower flight of stairs, the three lower, compact, and equidistant evergreens are Globe Arbor-Vitae (p. 124).

Now from the foot of the steps as we shall go behind the rose bed: The first shrub on our right is another Globe Arbor-Vitae. After that come four bushy plants which, we should observe, have two kinds of foliage, flat scale-like at the tips of the twigs and feathery needle-like nearer the base of the branchlets. In other words, some of the juvenile (p. 95) foliage has been retained. These are Ellwanger's Arbor-Vitae.[5] The taller evergreens behind are Plumed and Golden Plumed-Retinosporas, varying only in the color of their foliage.

Beyond these and directly behind the rose bed, the large bluish-colored evergreen is Veitch's Sawara-Cypress, commonly known in the trade as Moss Retinospora (p. 92). Behind it is another similar plant and next to it on the south side is a colored form, the Sulphur-colored Moss-Retinospora (p. 94). It is only in the early summer that the contrast in foliage on these forms is apparent.

The last three plants, one behind the other, with yellow stringy foliage, are Golden Thread-Retinosporas (p. 94).

Now we shall consider those on the north side of the stairway, beginning, this time, at the foot. The three low bushy plants that border the lower flight just as on the first side are Globe Arbor-Vitae, a fourth one of which is set a bit back. All the tall trees in the background are Plumed or Golden Plumed-Retinosporas, quite readily distinguishable by the color of their foliage. The four lower bushy shrubs below them and somewhat farther in than the Globe Arbor-Vitae are Ellwanger's Arbor-Vitae, the same as those we met on the other side.

Let us go beyond these last ones and behind the rose bed. Surrounded by all the Plumed Retinosporas, we see two bluish Moss-Retinosporas, one above the other. On the far side of the lower of these is a Sulphur-colored Moss-Retinospora (p. 94).

The five yellow stringy-foliaged shrubs that extend around the north end of this group farthest from the stairway are Golden Thread-Retinosporas (p. 94). We must ascend the embankment near them to the upper path and proceed toward the stairway now. The first three low bushy yellow plants along the path

[5] See Conservatory Bed No. 5.

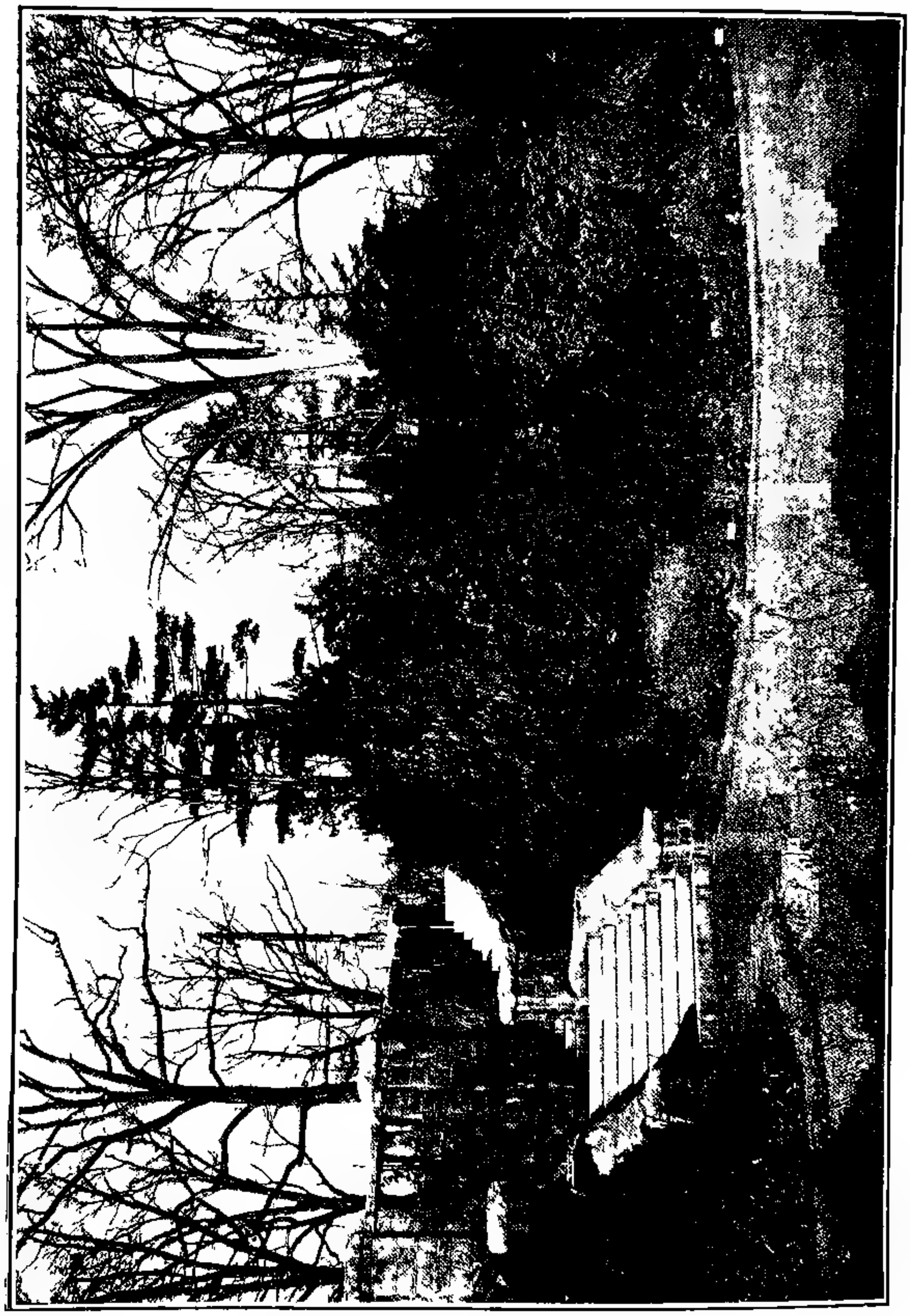


FIGURE 3. Rose-Garden Entrance. Golden Plumed Retinosporas and bluish Moss-Retinosporas add a pleasing touch of color to this fine group of evergreens that frame the stairway leading into the Rose Garden.

are Sulphur-colored Plumed-Retinosporas (p. 96). A fourth one of this kind stands behind the next two low spreading green forms at the corner. These last two are Pfitzer's Chinese-Junipers. All the trees in the background are Plumed and Golden Plumed-Retinosporas.

10. Conservatory Flower-Beds

Beds A and B

The only coniferous evergreens in Bed A are two Hicks' Yews (p. 145). In Bed B are a few Spiny Greek-Junipers, *Juniperus excelsa* var. *stricta* (p. 114).

Bed No. 2

At the northwest corner of Bed No. *2*, the first broad spreading coniferous evergreen with yellowish foliage is a Silvery or Variegated English-Yew (p. 143). Almost concealed under it on its northern side, *i.e.*, toward us, is a very much smaller Golden Peabody Arbor-Vitae (p. 129).

Next to the left is a very large and prominent Sulphur-colored Plumed-Retinospora (p. 96).

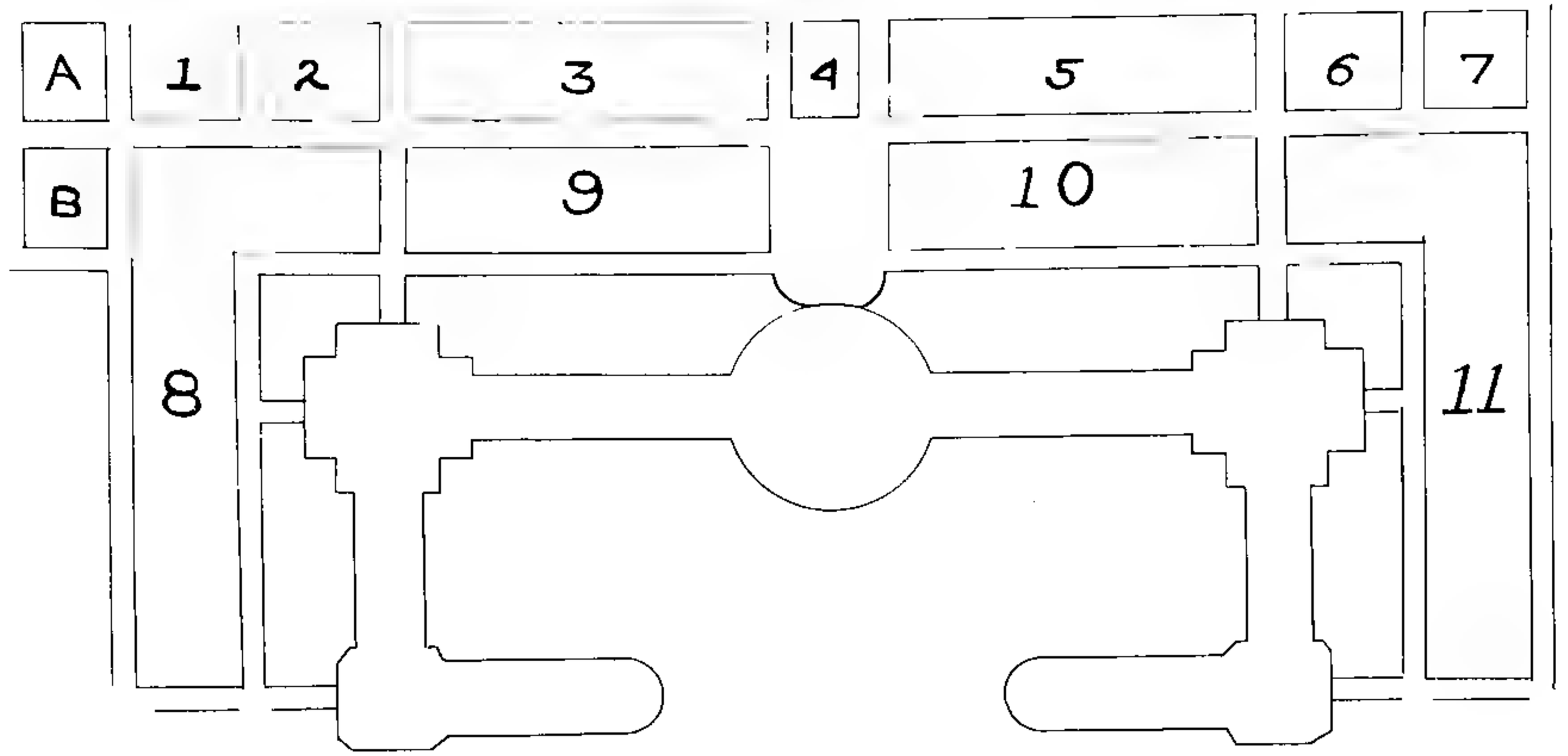
Next to the left are two taller more tree like specimens with a bluish cast on the new foliage. They are Douglas Fir (p. 88). Between them and inside the planting we can see an Umbrella Pine (p. 153).

Next in front and to the left of the Douglas Fir is a Golden Thread-Retinospora (p. 94). This completes the northern side of the bed.

On the eastern side are only two Douglas Firs, the right-hand one almost concealed behind a large bush of Japanese Holly.

On the southern side there is a Variegated English-Yew and in back of it to the left are two Douglas Firs. Between these last two and inside the area is a slightly smaller Nordmann's Fir (p. 74).

On the western side there are no new trees not seen from the other sides. The tallest specimens inside are Douglas Firs; the Nordmann's Fir is again visible in the right center and the first Variegated English-Yew stands at the left-hand corner.



Conservatory Flower-Beds

FIGURE 4 Ground plan of Conservatory Range No. 1 and of the flower-beds to the east, north, and west.

Bed No. 3

At the northwest corner of Bed No. 3 the two fuzzy bluish evergreens are Moss Retinosporas (p. 92).

Eight feet to the left of these are three rose-bushes and behind these latter are two partially concealed coniferous evergreens. The one farthest in is a Tiger-tail Spruce (p. 58), whose vigorous condition illustrates the tolerance of this species for shade. The other yellowish-tipped evergreen farther front is some variety of Arbor-Vitae.

Proceeding to the left we should see first a Norway Spruce, (p. 66), in the center of the bed whose very top just projects above the shrubbery otherwise concealing the tree. Next to the left is a taller and slightly more exposed Douglas Fir (p. 88) also in the center of the bed.

Next, left and more in the foreground, surrounded by shrubbery, is a Japanese Yew (p. 144).

Next, towering above the shrubbery, are three Veitch Firs (p. 73), the whitish under surface of whose leaves betrays them. In the immediate foreground in front of the shrubbery are two small Pfitzer's Chinese-Junipers (p. 110). We shall see a great many more of this splendid low evergreen in all the beds.

The next tall evergreen to the left of the deciduous shrubbery and in front of the taller and left-hand one of the three Veitch Firs is a Sawara Cypress (p. 95). Then comes a bluish Douglas Fir with its pendulous branches and beside it to the left and almost concealed by it another specimen of the same species. Directly behind these two and more on the other side of the area is a still taller Blue Colorado-Spruce (p. 59). Between them and in the center is an almost concealed Veitch's Fir, the same as the next two tall trees close by and in the center.

The next prominent tree to the left with bluish drooping foliage is a Douglas Fir. Between it and the taller Veitch Fir to the right is a small Nordmann's Fir (p. 74).

The next prominent evergreen to the left is a Japanese Yew (p. 144). To the left of it the taller more open tree is a Norway Spruce (p. 66) and behind and between them is a Veitch Fir. To the left of the Norway Spruce and more within the area is an Umbrella Pine (p. 153) with two slender Blue Nootka-Cypresses (p. 106) in front of it and a bit left.

In front of the last few trees we notice several smaller bushy forms with light-green foliage distributed amid the shrubbery They are all forms of Arbor-Vitae.

The remaining four coniferous trees farther left in the center of the area are two Norway Spruces and two taller Cryptomerias (p. 155). The former have the distinct spreading limbs.

The last evergreen on this side at the corner is a Golden English-Yew (p. 142). There may appear to be little difference at first between this and the Variegated English-Yew, which we have already met in the beds. They are, however, quite distinct, as a little close comparison will quickly reveal.

On the east side we see this last-named Yew, the taller Cryptomeria in the middle, and to the left a Sulphur-colored Plumed-Retinospora (p. 96).

Going around on the southern side, there is first a Golden Thread-Retinospora (p. 94), and close behind it is a Golden Weeping Thread-Retinospora (p. 99). The position of these two shrubs so close together gives good accent to their difference in habit, which otherwise might not be so apparent.

To the left of these and behind the shrubbery is a Veitch's Fir with Cryptomerias on each side. To the left of the left-hand Cryptomeria is a smaller Golden Chinese Arbor-Vitae (p. 125).

Then comes an Umbrella Pine (p. 153). Next and nearer the other side is a Norway Spruce, in the middle a Veitch Fir, and in front of this last one a Golden Plumed-Retinospora (p. 94).

To the left of this last and in the opening in the shrubbery is a small Pfitzer's Juniper and a small Japanese Yew, the latter to the right. Inside the area at this point is a small Red Pine (p. 40) and behind it in the very interior is a still smaller Variegated Pyramidal Chinese-Juniper (p. 118).

Next comes a prominent Douglas Fir, inside behind the shrubbery, and then two taller Veitch Firs to the left followed by a Blue Colorado-Spruce. To the right of these last Veitch Firs and almost concealed by a large deciduous shrub is a Sawara Cypress.

In the foreground are several smaller evergreens. The one to the right and plainly a pine is a Red Pine. To the left of it is

FIGURE 5. Conservatory-Bed No. 4. A Weeping Hemlock, like the one which marks the corner of this bed, is among the most graceful and handsome of the slow-growing low evergreens.

a smaller Pfitzer's Juniper followed by another Red Pine, a Golden Plumed-Retinospora, and a taller droopy *Juniperus chinensis* var. *argentea variegata,* with its scattered whitish foliage in spring.

To the left of the next deciduous shrub are two bushy plants of some undetermined variety of Arbor-Vitae, followed by a taller Sawara Cypress. Inside we see three Veitch Firs.

Next in front is a Plumed Retinospora and beside it on the left a Variegated English-Yew. Behind this latter is a taller Chinese Arbor-Vitae (p. 124) readily recognized by its foliage in perpendicular planes, and behind it a still taller Douglas Fir.

To the left of the Chinese Arbor-Vitae and inside is a slender Japanese White-Pine (p. 15), with a taller and spreading Norway Spruce (p. 66) behind it and a bit left. In front of it is a smaller Chinese Arbor-Vitae.

The next low coniferous evergreen in the foreground is another undetermined variety of Arbor-Vitae, with a second and slightly taller specimen of the same variety in back of it, a bit left. Almost concealed in the shrubbery is a last Variegated English-Yew.

On the west side are only three very low Pfitzer's Junipers and the Moss Retinospora we began with at the corner.

Bed No. 4

Bed No. 4 is the smallest of all, lying directly opposite the entrance into the greenhouse. In the northwest corner is a Pfitzer's Juniper, lower than all the other plants about it. Next, left, are two larger spreading Variegated English-Yews (p. 143).

On the east side are, first, three Sulphur-colored Plumed-Retinosporas (p. 96) in a row followed by a Spiral Arbor-Vitae (p. 129). Behind and between the last two of these four plants and almost concealed is a slender common Arbor-Vitae (p. 125), another specimen of which is concealed to the right behind the large bushy sulphur forms. To the left of the Spiral Arbor-Vitae is a lower undetermined form of Arbor-Vitae and behind this another slender common Arbor-Vitae. Left of these the tall tree is a Plumed Retinospora (p. 93), as are the five similar tall trees in a row inside the area.

On the south side is a Pfitzer's Juniper in the center with a Weeping Hemlock (p. 82) at each side.

On the west side the three taller trees are Plumed Retinosporas with a Sulphur-colored Plumed Retinospora between the second and third. The remaining dense broad evergreen to the left is an Oriental Spruce (p. 63).

Bed No. 5

In the northwest corner of Bed No. 5 is a prominent fuzzy bluish Moss Retinospora (p. 92). Close behind it is a Red Pine (p. 40). Farther behind it and in the center of the bed surrounded by deciduous shrubbery are two Douglas Firs (p. 88). Behind the left hand of these two and more on the other side of the bed is a bushy Sulphur-colored Plumed-Retinospora (p. 96).

Next, left, close to the last and also in the center is a taller Umbrella Pine (p. 153).

The next taller tree is a Veitch Fir (p. 73), followed by a taller Plumed Retinospora (p. 93). In front of the last two trees stands a smaller Douglas Fir.

The next big evergreen with wide-flung branches is a Limber Pine (p. 46). To the left of it is a Veitch Fir and in the foreground a very large Pfitzer's Juniper (p. 110).

Next to the left are three Red Pines (p. 40) partially surrounded by two or three wide-spreading yellowish Variegated English-Yews (p. 143). The tall evergreen in the center behind these is a Japanese Cedar (p. 155).

The next tall evergreen to the left with two parallel main stems is an Oriental Spruce (p. 63). To the left of it are three Chinese Arbor-Vitae (p. 124), two of which are more on the other side. Their perpendicular foliage betrays them.

Next, more in the foreground, are two Spiral Arbor-Vitae, (p. 129) followed by a larger Douglas Fir (p. 88) close by. Close to this last one on the left is a similar tree.

The next two or three slender trees in the middle are common Arbor-Vitae. Behind the right-hand one is a Douglas Fir.

The next large prominent evergreen in the middle is a Giant Arbor-Vitae (p. 128). To the left of it and nearer us are three Chinese Arbor-Vitae (p. 124), whose perpendicularly arranged

foliage contrasts noticeably with that of the smaller American Arbor-Vitae which they partially surround. The wide-spreading flat-topped evergreen in front of these is a Dwarf Japanese-Yew (p. 143).

A bit to the right, just in front of the bushes, is an evergreen whose lower portion shows the dense compact foliage of the Dwarf Hinoki-Cypress (p. 92) and whose upper portion has

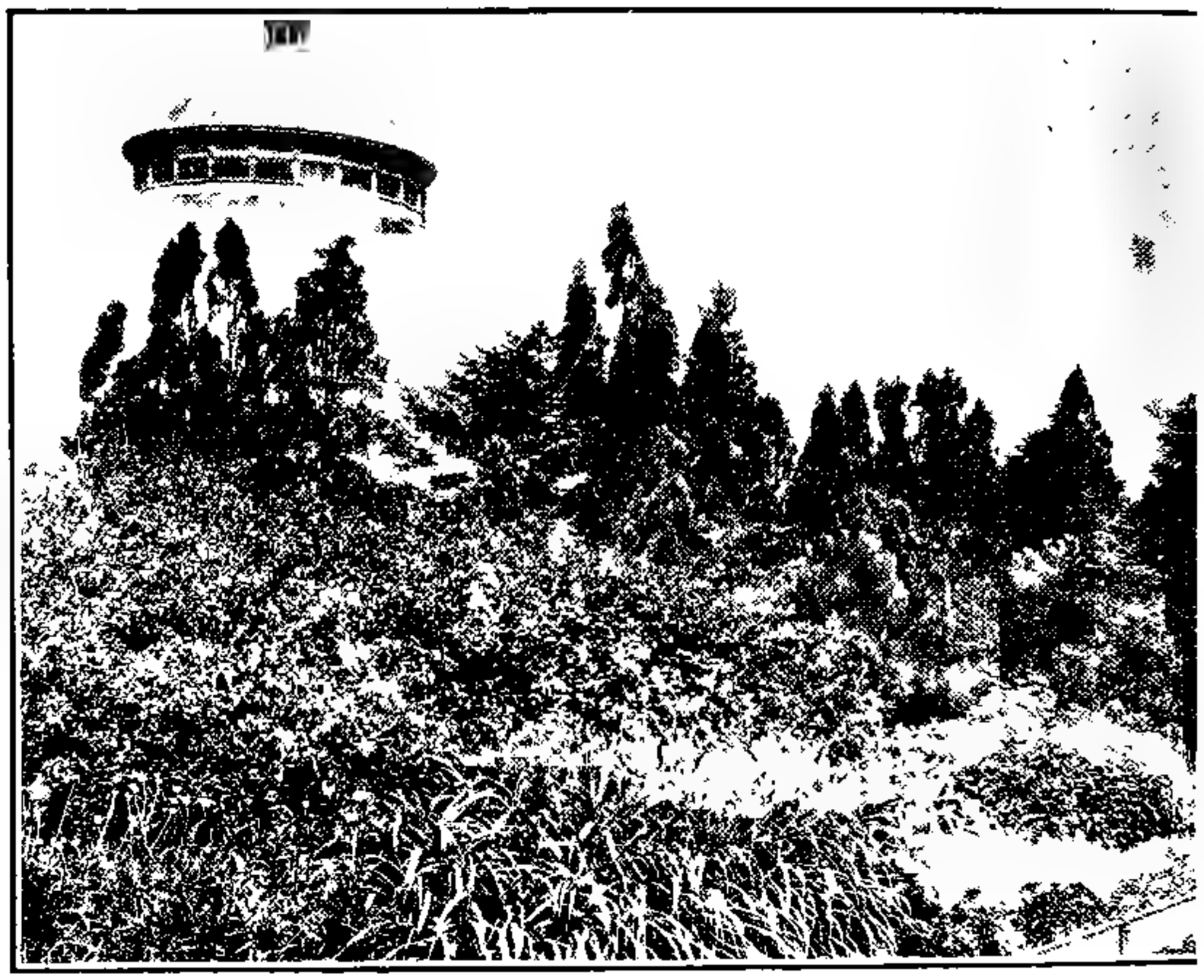


FIGURE 6. Conservatory Bed No. 5, where Chinese Arbor-Vitae and oth evergreens form a permanent background for deciduous shrubs and herb ceous plants.

different foliage, resembling that of the Slender Hinoki-Cypress (p. 93). This undoubtedly represents a case of grafting wherein the stock plant became more vigorous than the persisting scion.

To the left of the spreading Dwarf Japanese-Yew is a Red Pine (p. 40) and behind and between these is a Norway Spruce (p. 66).

Left of the pine and in front of the shrubbery is an undetermined variety of American Arbor-Vitae. The remaining taller

evergreens in the center include a common Arbor-Vitae, the smaller tree, and a Blue Nootka-Cypress (p. 106). The taller trees on the other side are Chinese Arbor-Vitae.

On the eastern side are two or three small White Spruces (p. 65) besides the taller trees in the background.

Proceeding around the southern side we see first a Douglas Fir, then a Spiral Arbor-Vitae to the left of it, and behind the latter a taller Chinese Arbor-Vitae (p. 124).

To the left are two Red Pines. Then next we see two round-headed bushy evergreens with a larger Norway Spruce behind the left-hand one and projecting between both. They are Variegated Pyramidal Chinese-Junipers (p. 118). In front of the Red Pines and behind the clump of Iris is a small Veitch Fir.

The next handsome evergreen in the center with yellowish-green foliage is the Giant Arbor-Vitae already noted from the other side. The bushy evergreens before it are Ellwanger's Arbor-Vitae, *Thuja occidentalis* var. *Ellwangeriana*. The foliage of this variety consists of scaly leaves on the tips of the twigs and needle-like leaves at their bases.

The next evergreen in the center to the left of the Giant Arbor-Vitae is a Red Cedar (p. 112).

The next two large evergreens in the center to the left of intervening shrubbery are Chinese Arbor-Vitae. In the foreground there is a small Japanese Torreya (p. 149) with its stiff yew-like foliage.

In the center to the left of the big Chinese Arbor-Vitae is an almost equally tall Oriental Spruce (p. 63). The next tall evergreen in the center to the left of a large bush is a Japanese Cedar (p. 154). To the left of this last and also in the center are two small Douglas Firs (p. 88). At the time of writing they are almost concealed by a Pfitzer's Juniper in front of them. The small bluish fuzzy evergreen to the right of this Pfitzer's Juniper is *Chamaecyparis pisifera* var. *squarrosa* (p. 102).

The next tall conifer that towers above the evergreen Japanese Holly in front of it is a Veitch Fir. Directly behind it is a Japanese Torreya (p. 149) and behind this is the wide-spreading Limber Pine already noted on the other side.

In front of the Japanese Holly are two or three small odd evergreens that winterkill badly every year and, excepting the

new foliage, are always brownish in the summer. They are Spaeth's Arbor-Vitae (p. 128).

The next large feathery-foliaged evergreen in the center is a Plumed Retinospora (p. 93).

To the left of it is a tall Veitch Fir, then an Umbrella Pine and finally a dense bushy Sulphur-colored Retinospora. Projecting behind this last is a Douglas Fir. The lower open evergreens in the middle foreground in front of these last few trees are Golden Arbor-Vitae.

On the west side no new evergreens are to be seen. The Moss Retinospora, with which we began this bed, stands at the left corner with a small Red Pine close to it.

Bed No. 6

At the northwest corner of Bed No. 6 are two Golden English-Yews (p. 142). At the northeast corner there is a Weeping Hemlock (p. 82).

On the eastern side we see a large Japanese Cedar (p. 155) behind a big evergreen Japanese Holly. Close to the left of the Holly is a smaller Ellwanger's Arbor-Vitae[6] and farther left is a small common Arbor-Vitae (p. 125).

On the south side we see the big Japanese Cedar to the right, a yellowish bushy Sulphur-colored Plumed-Retinospora (p. 96) in the center with another Japanese Cedar to the left of it. Behind this last is a larger Douglas Fir.

On the west side we see this same Douglas Fir with an equally tall Thread Retinospora (p. 100), to the left of it. In front of the Douglas Fir is a narrow Blue Nootka-Cypress (p. 106) and to the left of it is a smaller Douglas Fir.

Bed No. 7

In Bed No. 7, which represents the winning design of the 1926 Small Garden Competition, only a few coniferous evergreens are to be seen. Along the eastern side there is one small American Arbor-Vitae (p. 125).

[6] See Conservatory Bed No. 5.

On the south side there are four evergreens along the railing. The two middle ones are Red Cedars (p. 112). The two outside ones are Japanese White-Pines (p. 26).

Bed No. 8

Bed No. 8 is the long one along the western side of the Conservatory. Beginning at the southern end, the wide-spreading dark-colored evergreen in the background is a Dwarf Japanese-Yew (p. 143). To the left of it are two Golden Thread-Retinosporas (p. 94) followed by a large evergreen Japanese Holly.

In the next twenty feet are several Variegated English Yews (p. 143), with bright yellowish foliage in summer. Other shrubbery is mixed in with them.

Next to the left is a large Pfitzer's Juniper (p. 110). Then come two Norway Spruces (p. 66), followed by an awkward Variegated English-Yew. The next nearby tall tree behind the barberry is an Oriental Spruce (p. 63).

To the left of the barberries is a dark-colored Tiger-tail Spruce (p. 58).

Then comes a spreading Pfitzer's Juniper, followed by two Spiral Arbor-Vitae (p. 129) with a Red Pine (p. 40) between them.

The next handsome dark-colored tree is a Dwarf Hinoki-Cypress (p. 92). To the left of it are two yellowish bushy Sulphur-colored Plumed-Retinosporas (p. 96). The tops of these two bushes differ from the lower parts because of reversion to a simpler form.

Next left is a Blue Colorado-Spruce (p. 59). Then comes an Arbor-Vitae (p. 125) followed by a White Spruce (p. 65). In front of this last is a smaller Globe Arbor-Vitae (p. 124).

To the left of the White Spruce is a Tiger-tail Spruce (p. 58). Behind the Japanese Hollies which we see next are two Blue Colorado-Spruces (p. 59). The left-hand one seems somewhat deformed. Evidences on the lower portions of their trunk seem to indicate that both trees are grafted and probably represent the variety *pendula;* they have, however, tended to grow upright, particularly the right-hand one.

At the very corner of this bed near the railing the low broad-spreading evergreen mass consists of several plants of the Varie-

gated Chinese-Juniper, *Juniperus chinensis* var. *variegata.* During summer it is spotted light yellow here and there. Behind it the tall, dark, and also broad-spreading plant is a Dwarf Japanese-Yew.

Proceeding eastward now around the north end of the bed, we pass first this last yew, the low juniper and the taller Blue Colorado-Spruces. Close to these last are two yellowish Sulphur-colored Plumed-Retinosporas with a Golden Chinese Arbor-Vitae (p. 125) behind them and two Thread Retinosporas (p. 100) to the left. The next and last tall evergreen behind the barberry is a Hinoki Cypress (p. 98).

At the eastern end of the bed we see the graceful green drooping foliage of a Weeping Hemlock (p. 81). Behind and to the right of it the three larger yellow bushes are Sulphur-colored Plumed-Retinosporas (p. 96). The other three yellowish evergreens to the right of them are Golden Thread-Retinosporas (p. 94).

Bed No. 9

Proceeding eastward from the western end of Bed No. 8 the first dark-colored spreading evergreen is a Dwarf Japanese-Yew (p. 143). To the left are two Yellow Variegated English-Yews (p. 143).

The next large clump of fuzzy bluish trees consists of Moss Retinosporas (p. 92).

To the left of these are two or three large Pfitzer's Junipers (p. 110). Then come three Red Pines (p. 40) and three plants of some variety of American Arbor Vitae (p. 125).

The next prominent group of six bushy evergreens, yellowish cream colored in summer, consists of Sulphur-colored Moss-Retinosporas (p. 94).

At the eastern end are three more bushy yellowish Sulphur-colored Plumed-Retinosporas (p. 96) and behind them a group of greener Ellwanger's Arbor-Vitae.[7]

Bed No. 10

At the western end of Bed No. 10 there is a Weeping Hemlock (p. 81). Behind it and extending to the left are three upright

[7] See Bed No. 5.

trees. The right-hand one is a Norway Spruce (p. 66) and the other two are White Spruces (p. 65). On the left side of the left-hand one of these is a Red Pine (p. 40), in front of which are two Japanese Yews (p. 144). And on each side of one of these yews is a Golden Thread-Retinospora (p 94).

The next tall evergreen in the rear is a Plumed Retinospora (p. 93) and to the left of it are several more Golden Thread-Retinosporas. Two small Golden Peabody Arbor-Vitae (p. 129) stand close by with their yellow-edged flat fronds of foliage. Three greener forms are right here too. The two far ones are probably Golden Arbor-Vitae, *Thuja occidentalis* var. *aurea,* and the forward more bushy one is an undetermined variety of Arbor-Vitae. Finally, the fuzzy bluish evergreen at this point is a Moss Retinospora (p. 92).

Next in the background are several Red Pines (p. 40) and two forms of Arbor-Vitae, the latter close together. The right-hand half is composed of Golden Arbor-Vitae and the others are some other form of Arbor Vitae. There is one small White Fir (p. 76) close by.

The low dense stiffly tufted evergreens next are Mugho Pines (p. 44) partially surrounding a small Golden Thread-Retinospora (p. 94). The grayish green plant in the background with one or two extended branches is a Pfitzer's Juniper (p. 110).

The next extended mass of yellowish foliage in the background is that of Variegated English-Yews (p. 143). One green Japanese Yew (p. 144) stands very close in front of them, with three Red Pines (p. 40). Just to the left of this Japanese Yew there is a partially concealed Ellwanger's Arbor-Vitae and to the left of it are three closely set bushy Sulphur-colored Plumed-Retinosporas (p. 96).

The next upright delicate-foliaged evergreen is a Canada Hemlock (p. 83). The remaining coniferous evergreens include a few Red Pines and three large bushy separated Sulphur-colored Moss-Retinosporas in the background.

Bed No. 11

At the western end of Bed No. 11 there is a Weeping Hemlock (p. 81). To the left of it are two Red Pines (p. 40). Behind these are two yellowish bushy evergreens. The right-hand one is

a Golden Plumed-Retinospora (p. 94) and the left-hand one is a Sulphur-colored Plumed Retinospora.

Then come two evergreen Japanese Hollies and next to the left is a large Thread Retinospora (p. 100). The next five bushy yellowish evergreens are Sulphur-colored Retinosporas, followed by one Golden Thread-Retinospora (p. 94). Then a wide-spreading Variegated English Yew (p. 143). The tall upward-projecting tree in the background is an Arbor-Vitae (p. 125).

To the left of the large Variegated English-Yew there is an almost concealed green Ellwanger's Arbor-Vitae, followed by four large Golden Thread-Retinosporas. Two or three Red Pines and another Ellwanger's Arbor-Vitae stand next in front. Then come three large bushy Sulphur-colored Plumed Retinosporas.

At the corner by the paths there is a wide-spreading green Japanese Yew (p. 144) and to the right of it a smaller Golden English-Yew (p. 142).

Now we shall turn the corner, passing the Japanese Yew and Japanese Holly, and see next a tall Arbor Vitae with the Sulphur-colored Retinosporas behind it. Next to the left the fuzzy bluish tree is a Moss Retinospora (p. 92) followed by a Japanese Yew. Then comes a smaller Golden Plumed-Retinospora, and equally small Golden Thread-Retinospora, and behind the last one a taller White tipped Red-Cedar (p. 116).

Next is a clump of Variegated English-Yew (p. 143). Then come several smaller evergreens with taller ones behind them. In the forward row are five Plumed Retinosporas and two Golden Plumed Retinosporas. Behind them are, first, another Plumed Retinospora, then a Swiss Stone-Pine (p. 13) and lastly a bushy Slender Hinoki-Cypress (p. 93).

Next to the left is an English Yew (p. 146), followed by three more Plumed Retinosporas with three fuzzy blue Moss Retinosporas in front of them. The next yellowish evergreen is a Golden Peabody Arbor-Vitae (p. 129) followed by a broader Golden Thread Retinospora. Then come two small Plumed Retinosporas and a small Golden Thread-Retinospora followed by a larger spreading Variegated English-Yew.

Next we find a small Golden Plumed-Retinospora and a small Plumed Retinospora with a small Pfitzer's Juniper (p. 110)

behind them. These are followed by a larger spreading Variegated English-Yew and then a taller Plumed Retinospora with five more smaller trees of the same kind beyond. Behind the last of these is an Arbor-Vitae with a Red Cedar (p. 112) on each side. Then come two denser Spiral Arbor-Vitae (p. 129).

After these we find a Compact Slender Hinoki-Cypress (p. 93) followed by a narrow Pyramidal Arbor-Vitae (p. 125) and three Plumed Retinosporas. To the left of the next Japanese Holly is a yellowish Golden Thread-Retinospora (p. 94), followed by a small Plumed Retinospora, a Japanese Yew, and a taller Chinese Arbor-Vitae in the background. Then come two Plumed Retinosporas and lastly a large clump of Variegated English-Yew (p. 143).

EDMUND H. FULLING.

NOTES, NEWS, AND COMMENT

The following visiting botanists have registered in the library during the summer: Dr. Ivan M. Johnston, Gray Herbarium; Mrs. Lincoln W. Riddle, Farlow Herbarium, Cambridge, Mass.; Profs. L. H. Bailey, H. H. Whetzel, Ralph W. Curtis, and Jesse F. De France, Ithaca, N. Y.; Miss Caroline K. Allen, Pawling, N. Y.; Miss Marjorie F. Warner, and Messrs. W. W. Eggleston and William W. Diehl, Washington, D. C.; Prof. E. N. Transeau, Columbus, Ohio, and Prof. William A. Beck, Dayton, Ohio; Prof. Shigeo Yamanouchi and Dr. Earl E. Sherff, Chicago, Ill.; Mr. Edwin E. Honey, Albion, Mich.; Brother A. Benedict, F.S.C., Santa Fé, New Mexico; Prof. E. D. Merrill, Berkeley, Calif.; Mrs. Susan G. Stokes, San Diego, Calif., and Mr. S. C. Edwards, Colton, Calif.; Dr. Lulu O. Gaiser, Toronto, Ont.; Mr. W. B. Freeman, Trinidad, B. W. I.; Dr. B. Němec, Prague, Czechoslovakia; Prof. P. Jaccard, Zürich, Switzerland, and Prof. Tomosuke Nakashima, Chosen, Japan.

Dr. Fred J. Seaver, Curator, has recently returned from an extended mycological foray through the mountains of Colorado, Wyoming, and South Dakota, in coöperation with Mr. Paul F. Shope, of the University of Colorado. The object of the expedition was to collect and study the fungi of those regions concern-

ing which very little is known. In connection with this expedition, he also attended the summer meeting of the Botanical Society of America held in the University of Wyoming summer camp located in the Medicine Bow Range Mountains. The camp was located at an elevation of 9,500 feet. An expedition was made to the top of the range in the regions of perpetual snow. One of the items of interest in this vicinity was the " red snow," caused by an alga which grows in such abundance as to give the snow a blood red color. During the stay in the West, Dr. Seaver and Mr. Shope were invited to accompany Professor Henderson, Curator of the Museum in the University of Colorado, on a week's trip through the Black Hills of South Dakota. Several days were spent in this region, camping at an elevation of 6,500 feet and many interesting fungi collected. One of the interesting fungi obtained was the " ink-spot " fungus of the aspens, so abundant in the mountain region. Although this fungus has been known for a number of years, its life history has never been thoroughly worked out. For the first time the perfect stage has been collected and a detailed study will be made in the near future. From 25 to 75 per cent. of the leaves of the aspens there are often killed by the fungus, causing the trees to become much disfigured and in many cases killed outright. Between 500 and 600 collections of fungi were brought back and these will be studied and divided in numerous sets and used for exchange duplicates in order to add to the already extensive collections of The New York Botanical Garden. A more detailed account of this expedition will be published in *Mycologia*.

ACCESSIONS

Library Accessions from June 1 to July 31 (Continued)

Trelease, William. *Plant materials of decorative gardening: the woody plants.* Ed. 3. rev. Urbana, 1926. (Given by the author.)

———. *Winter botany: a companion volume to the author's Plant materials of decorative gardening.* Ed. 2. rev. Urbana, 1925. (Given by the author.)

Tukey, Harold Bradford. *The pear and its culture.* New York, 1928.

Turrill, William Bertram. *The plant life of the Balkan peninsula: a phytogeographical study.* Oxford, 1929.

Van Meter, Ralph Albert. *Bush fruit production.* New York, 1928.

VINAL, WILLIAM GOULD. *Nature guiding* Ithaca, 1926.
WAGNER, HERMANN. *Gras-Herbarium.* Ed. 4, Lieferung 1–10 Bielefeld, n.d. (Given by Miss C. C. Haynes.)
WAGNER, HERMANN. *Phanerogamen-Herbarium.* Lieferung 1–8. Bielefeld, 1856–58. (Given by Miss C. C. Haynes.)
WAHLENBERG, GÖRAN. *Inledning til Caricographeen.* 4 parts. [Stockholm.] 1802–1803. (Given by Mr. K. K. Mackenzie.)
WARNER, ROBERT. *Select orchidaceous plants* [Series 1]. London, 1862–65. (Given by Mr. Ludwig J. Manz.)
WAUGH, FRANK ALBERT. *Hardy shrubs.* New York, 1928.
WEAVER, JOHN ERNST, & BRUNER, WILLIAM E. *Root development of vegetable crops.* New York, 1927.
WEISS, FREDERICK ERNEST. *Plant life and its romance.* London, 1928.
WESMAEL ALFRED. *Monographie de toutes les espèces connues du genre Populus.* Mons, 1869.
WHETZEL, HERBERT HICE, HESLER, LEXEMUEL RAY, GREGORY, CHARLES TRUMAN, & RANKIN, WILLIAM HOWARD. *Laboratory outlines in plant pathology.* Ed. 2. Philadelphia, 1925.
WILSON, ERNEST HENRY. *Aristocrats of the garden.* Ed. 3. Boston, 1926.
———. *China, mother of gardens* Boston, ©1929.
———. *More aristocrats of the garden.* Boston, 1928.
WRIGHT, RICHARDSON. *The gardener's bed-book.* Philadelphia, 1929.

LIBRARY ACCESSIONS DURING AUGUST, 1929

ADAMOVIČ, LUJO. *Die Pflanzenwelt der Adrialänder.* Jena, 1929.
ADLERZ, ERNST. *Bladmossflora för Sveriges laglånd.* Örebro, 1907
Afhandlingar rörande natur-wetenskaperne. 2 pts. Fahlun, 1830–31.
ANDERSSON, CARL FILIP GUNNAR, & BIRGER, SELIM BIRGER GOTTHARD. *Den norrländska florans geografiska fördelning och invandringshistoria med särskild hänsym till dess sydskandinaviska arter.* Uppsala, 1912.
ANDERSSON, CARL FILIPP GUNNAR, & OTHERS. *Stockholmstraktens växter . . . utgiven av Botaniska sällskapet i Stockholm.* Stockholm, 1914.
ANDERSSON, NILS JOHAN. *Inledning till botaniken.* 3 parts. Stockholm, 1859–61. ——— Pt. 2, Ed. 2. Stockholm, 1865. ——— Pt. 3, Ed. 2. Stockholm, 1869 (Called Lärobok i botanik). ——— Pt. 1, Ed. 7. Stockholm, 1874.
———. *Lärobok i botaniken.* Pt. 1, Ed. 2. Stockholm, 1855.
———. *Femhundra afbildningar af mera allmänt förekommande svenska växter.* Pt. 1, text; pt. 2, plates. Stockholm, 1870.
ANTEVS, ERNST VALDEMAR. *Die liassische Flora des Hörsandsteins.* Stockholm, 1919.

ARESCHOUG, FREDRIK WILHELM CHRISTIAN. *Botanikens elementer.* Ed. 2. Lund, 1869. Ed. 3. Lund, 1883.

———. *Läran om växterna* Lund, 1875.

———. *Läran om växterna i sammandrag.* Ed. 4. Lund, 1891.

ARESCHOUG, JOHAN ERHARD. *Lärobok i botanik.* Stockholm, 1860–63.

ASCHERSON, PAUL FRIEDRICH AUGUST, & GRAEBNER, PETER PAUL. *Flora des nordostdeutschen Flachlandes (ausser Ostpreussen).* Berlin, 1898–99.

AUBERT, EPHREM LOUIS MARIE. *Histoire des plantes.* Paris, 1903.

BAUR, ERWIN, & HARTMANN, MAX, EDS *Handbuch der Vererbungswissenschaft.* Lief. 1, 4, 6–9. Berlin, 1927–29.

BEGER, HERBERT K. E., & BEGER, ELSE. *Biologie der Trink- und Brauchwasseranlagen.* Jena, 1928.

BERTALANFFY, LUDWIG. *Kritische Theorie der Formbildung.* Berlin, 1928.

BETHGE, HANS *Melosira und ihre Planktonbegleiter.* Jena, 1925.

BLANCK, EDWIN, & OTHERS. *Die Verwitterungslehre und ihre klimatologischen Grundlagen* Berlin, 1929.

BRAUN-BLANQUET, JOSIAS. *Pflanzensoziologie: Grundzüge der Vegetationskunde.* Berlin, 1928.

BRAUNER, LEO. *Das kleine pflanzenphysiologische Praktikum . . . das gleichnamigen Werkes von W. Detmer.* Ed. 5. 1 Teil. *Die Chemie des Pflanzenkörpers.* Jena, 1929. (Given by Dr. J. H. Barnhart.)

CANABAEUS, LOTIE. *Uber die Heterocysten und Gasvakuolen der Blaualgen und ihre Beziehungen zueinander.* Jena, 1929.

CLEVE, PER TEODOR. *Om stenkol deras uppkomst, utbredning och betydelse.* Ed. 2, *samt Om Skanes stenkolsformation af E. Erdmann.* Stockholm, 1874.

CONWENTZ, HUGO WILHELM. *Untersuchungen über fossile Hölzer Schwedens.* Stockholm, 1892.

DÖPP, WALTER. *Untersuchungen über die Entwicklung von Prothallien einheimischer Polypodiaceen.* Jena, 1927.

GEMLINHARDT, ERNST BERTHOLD KONRAD. *Die Gattung Synedra in systematischer, zytologischer und ökologischer Beziehung.* Jena, 1926.

GOEBEL, KARL EBERHARD. *Organographie der Pflanzen.* Pt. 1, Ed. 3. *Allgemeine Organographie.* Jena, 1928.

GOLDSCHMIDT, RICHARD. *Die Lehre von der Vererbung.* Berlin, 1927.

GOTHAN, WALTHER ULRICH EDUARD FRIEDRICH. *Die Entwickelung der Pflanzenwelt im Laufe der geologischen Epochen.* Osterwieck, 1909.

———. *Die fossilen Holzreste von Spitzbergen.* Stockholm, 1910.

GRAEBNER, PETER PAUL *Lehrbuch der allgemeinen Pflanzengeographie nach entwicklungsgeschichtlichen und physiologischökologischen Gesichtspunkten.* Ed. 2. Leipzig, 1929.

HASELHOFF, EMIL, & BLANCK, EDWIN. *Lehrbuch der Agrikulturchemie.* Pt. 1. Berlin, 1927.

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THE SHRUB YELLOW-ROOT

This low shrub, the only known species of the genus Xanthorhiza, has long been of great interest to botanists, pharmacists, and horticulturists. The wood of its long, slender rootstocks is bright yellow and bitter; its long-stalked, pinnately compound leaves are attractive and for a shrub unusual, clustered at the ends of short, usually or often unbranched stems, with shining, ovate, toothed, or incised segments; the very small, brownish-purple flowers are borne in slender, drooping, compound racemes or panicles, appearing in April or May, while the leaves are unfolding, and are succeeded by small heads of inflated, yellowish, 1-seeded follicles. It was discovered in Georgia by John Bartram in 1760, and subsequently grown by him in his garden, and introduced into England by John Bush in 1766; there is some evidence to indicate, however, that it may have been known to Banister, in Virginia, many years previously.

The plant is from one to four feet high and grows naturally in woodlands, from western New York to Kentucky, eastern Texas, Virginia, and Florida, and has often been brought into gardens in the eastern United States, where it grows luxuriantly and persistently, as also in northern Europe. It does not appear to have any natural enemies, being in this respect like some other monotypes, doubtless having come through an enormous geological time period, with all its immediate relatives lost, and itself become resistant or unadapted to serious insect or fungus depredations. Dr. Hollick has been unable to find any fossil species described, however. Dr. Seaver tells me that one minute species of parasitic fungus, *Phyllosticta Xanthorhizae*, forming small spots, has been described on its leaves from West Virginia. Its natural

range as far west as Texas has been overlooked or doubted by r
cent authors, although recorded by Torrey and Gray in 184
(Flora of North America 1 : 40). It may not exist in Texas nov
but proof that it did in 1837, is had by a specimen preserved i
Dr. Torrey's herbarium sent to him by Dr. Leavenworth, with
letter dated August 3, 1837, labelled as collected by Dr. Veatch a
Zavalla, Texas. I am indebted to Dr. Barnhart for calling my at
tention to this letter.

Most botanical authors have included the plant in the Crowfoc
Family (Ranunculaceae), its floral structure being regarded a
more nearly in that affinity than elsewhere, perhaps as near th
Baneberries (*Actaea*) as any other existing genus, and its foliag
somewhat resembles that of those plants, but its fruit is widel
different, as also its shrubby habit of growth. This affinity ha
not been undisputed, however, as by J. U. Lloyd and C. G. Lloy
in " Drugs and Medicines of North America " 1 : 291–304 (1886)
where it is maintained that it is better included in the Barber
Family (Berberidaceae), its rootstocks being said to be so nearl
like those of the Oregon Grapes, *Berberis repens* and *Berberi*
Aquifolium (*Odostemon* species) that they could be substitute
in commerce, and the yellow coloring matter had been shown a
long ago as 1862 to be the bitter alkaloid berberine.

The floral structure of the Crowfoot and the Barberry Familie
is closely similar, but this plant seems to be no more at home witl
Barberries than it is with Buttercups. It would not be surprisin
if some author should propose classifying *Xanthorhiza* in a fam
ily by itself, and thus further emphasize its high specialization
grouping it between Ranunculaceae and Berberidaceae. Plant
were established in the Fruticetum at The New York Botanica
Garden in 1896, obtained from the nursery of Thomas Meehar
and Sons at Germantown, Pennsylvania, and have been persisten
and luxuriant ever since; the colony there has required trimmin
from time to time to keep it from over-spreading; it is now a
dense mass about eight feet in diameter, located a short distanc
north of the west end of the Long Bridge, near various species o
Berberis and *Odostemon* (Berberidaceae), grouped to illustrat
the Buttercup Family (Ranunculaceae).

The Boulder Bridge, south of the Long Bridge, was built i
1907; in constructing the path across it small and rather shallo

planting pockets were provided on both sides, and knowing that the *Xanthorhiza* grew naturally in Virginia in rocky woodlands, it was planted in these pockets, where it has persisted luxuriantly on the southern side, but less so and somewhat broken and damaged by trampling on the northern side, where it is fully exposed to the sun. It has also been used effectively at places in backgrounds for the flower-gardens around Conservatory Range No. 1.

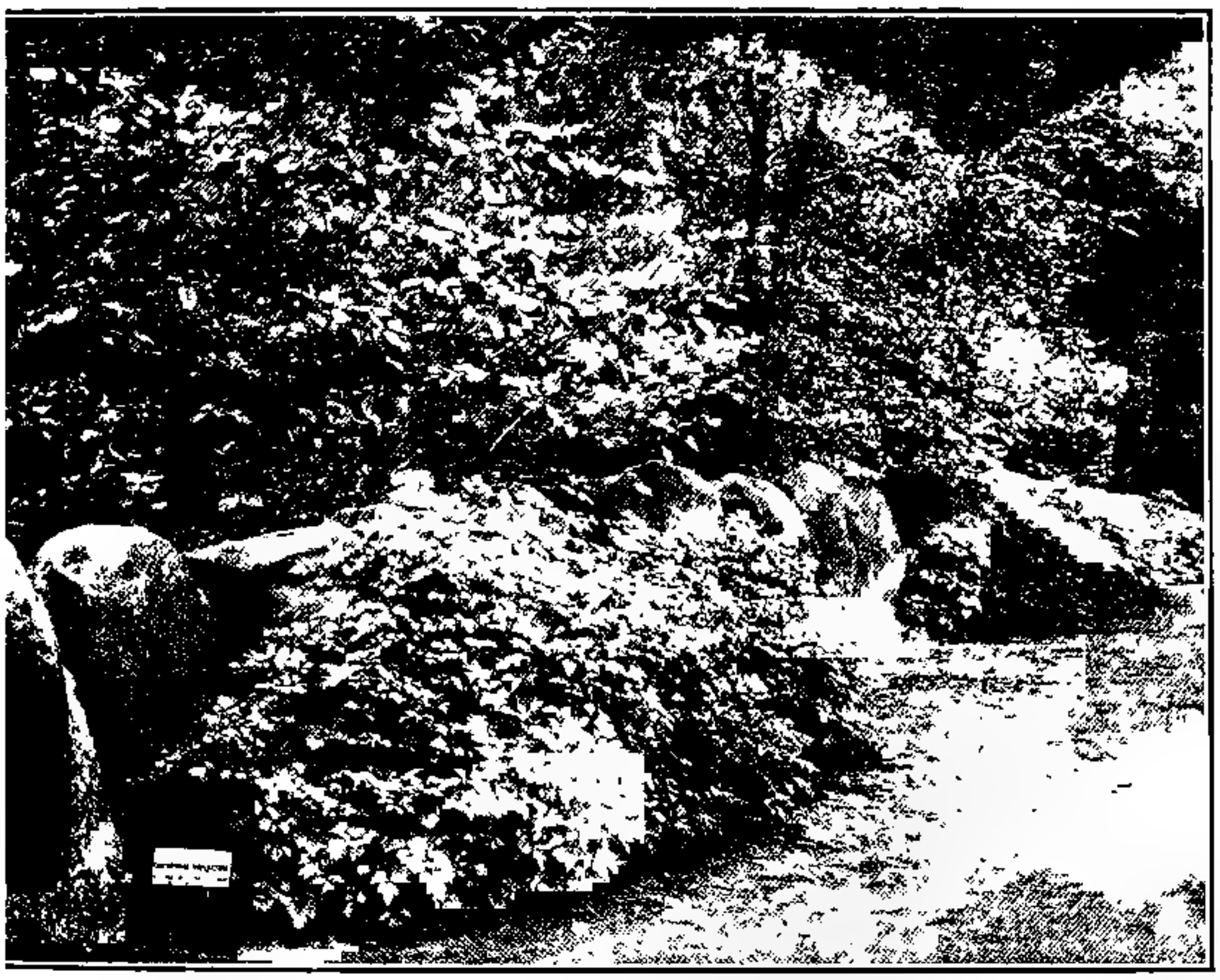

FIGURE 1. The Yellow-root, *Xanthorhiza simplicissima*, growing on the Boulder Bridge, in The New York Botanical Garden, from a photograph by Miss Griffith.

Medicinally it is not now regarded as of importance, although as a drug it was given prominence in the earlier pharmaceutical literature of the United States, but discarded from the United States Pharmacopoeia in the edition of 1880.

Bibliographically, this plant has recently been brought into prominence by Mr. T. A. Sprague in "Bulletin of Miscellaneous Information," of the Royal Botanic Gardens, Kew, England, 1929: 235, 236, where, characterizing it as aberrant, he points out

that the botanical name *Zanthorhiza apiifolia* given to it by L'Heritier, and used for it by nearly all authors under *Zanthorhiza* or *Xanthorhiza* must, by the application of the nomenclatorial rule calling for the use of the earliest published specific name be abandoned in favor of *Xanthorhiza simplicissima* Marshall. Marshall's "Arbustum Americanum," where the genus and species are described on page 167, was without doubt published as a small octavo volume late in 1785. L'Heritier's "Stirpes Novae aut minus Cognitae," an illustrated folio volume, bears the date 1784 on the title-page, but this is erroneous, because it was published in seven fascicles, and fascicle 4, in which *Zanthorhiza apiifolia* was described on page 79, and beautifully illustrated on plate 38, although bearing the date 1785, was not published until March, 1788, as recorded by Britten and Woodward in 1905 (Journal of Botany 43: 267), a decision accepted by Mr. Sprague and also by Dr. Barnhart as correct, but not taken up by authors, all of us having hesitated for one reason or another. It thus appears that we must henceforth use the name *Xanthorhiza simplicissima* Marshall.

Marshall, perhaps, thought that L'Heritier had the priority, because there is in Dr. Torrey's herbarium, deposited at The New York Botanical Garden, a well-preserved specimen of the plant, collected in Marshall's garden, near Westchester, Pennsylvania, on May 12, 1827, thus over 102 years old, labelled *Xanthorhiza apiifolia.*

It is of interest to note, that in "Drugs and Medicines of North America," above cited, it is maintained that *simplicissima* is the right name to use, the false date on the title-page of L'Heritier's work being there discussed, thus anticipating Mr. Sprague's result by 43 years; caustic criticism of the French author is there indulged in, perhaps without forethought, because while the title-page of "Drugs and Medicines of North America" bears date 1884–1885, its last part, containing the learned account of *Xanthorhiza* is dated March, 1886!

In "Botanisher Jahrbücher" 16: 319, 320, published in 1892, Herr Huth gives an account and description of the genus and species, with reference to the contribution by Messrs. Lloyd, and describes a variety *ternata*, having simply ternate leaves, the leaflets cuneate-based and with entire lobes, founded on a specimen

in the herbarium of Portenschlag, preserved in the imperial herbarium at Vienna; we have not seen foliage agreeing with this description. Huth's orthography is *Xanthorrhiza apiifolium*; under the geographic distribution of the genus he erroneously cites the range from Carolina to New York as in the Pacific region of North America, but has it correct, as Atlantic, in his account of the species.

The generic name *Xanthorhiza* is Greek, with reference to the yellow wood; perhaps the spelling *Xanthorrhiza,* favored by several authors, as by Mr. Leggett in 1870 (Bulletin of the Torrey Botanical Club 1: 14) will be regarded as preferable, although departing from Marshall's original spelling; it thus appears in Britton & Brown's "Illustrated Flora of the Northern States and Canada," as Judge Brown followed Mr. Leggett's dictum.

The specific name *simplicissima* refers to the simple, often or nearly unbranched stems; it is not quite definite, however, because on plants three or four feet high, there are often two to five branches near the top; *apiifolia* is with reference to the resemblance of its leaves to those of Parsley, which is not very close, and the plant has also been called Parsley-leaved Yellow-root. The specific name *tinctoria,* referring to the yellow pigment, was maintained for it by Dr. Woodhouse in 1802 (Medical Repository 5: 159), because he did not regard either of the others as accurately descriptive; it may be remarked, finally, that prior to Marshall's botanical descriptions of the genus and species in 1785, the plant had been designated *Marbosia tinctoria,* probably by its discoverer, John Bartram, but no botanical publication of this, its oldest name, appears to have been effected (see Drugs and Medicines of North America 1: 294).

N. L. Britton.

THE DEVELOPMENT OF SEEDLESS FRUITS BY BREEDING[1]

At the present time there is no seedless fruit among the tree, vine, or small fruits of out-door culture that is grown in commercial proportions in the State of New York. We may therefore ask ourselves in which of our various fruits will it be of advantage to have seedless kinds, and in which of these will it be possible to obtain such varieties. In other words, do we want seedless fruits, and, if we do, can we have what we want?

Nearly 40 years ago (1890) Dr. E. Lewis Sturtevant, who had shortly before retired as the first Director of this State Experiment Station where we are guests today, wrote a paper summa rizing much historical and horticultural lore regarding the occurrence of seedless fruits.[2] We need not spend the time today to review the list of such plants mentioned in that paper and in more recent horticultural and botanical records. We may, however, note that seedless or near-seedless fruits have appeared in such a wide variety of plants that the development of such fruits seems possible for any fleshy fruit.

It is worth our notice and reflection to recall that some of the world's most important fruits are seedless. Seedless bananas, especially of the Gros Michel clon, the Washington Navel Orange, and various of the seedless pineapples are to be purchased in quantity in season at almost any fruit shop and grocery store throughout the entire United States. The Sultanina or Thompson seedless grape is one of the world's most important raisin grapes, and in recent years it is also being widely eaten as a table grape. The seedless bread-fruits are valuable foods in the tropics. The near-seedless Marsh grape fruit and the Eureka lemon are the élite fruits of their respective kinds. The commercial culture of the seedless persimmons is rapidly being extended in California. Other tropical fruits, seedless or near-seedless, could be mentioned, which have much promise. Seedless fruits rank high in tropical and subtropical horticulture.

[1] A paper presented to The New York State Fruit Testing Association at its Eleventh Annual Meeting, which was held at the New York Agricultural Experiment Station, Geneva, N. Y., September 19 and 20, 1929.

[2] On Seedless Fruits. Memoirs Torrey Botanical Club 1: 141–185. 1890.

When we turn out attention to the crops widely grown in our temperate region, we note that seedless or near-seedless fruits have long been known in the apple, in the pear, and among certain of the stone fruits and the small fruits, and that plants bearing seedless berries have rather frequently appeared among the seedlings of our hardy grapes. But in none of these has any plant given seedless fruit of size, quality, and productiveness to the de-

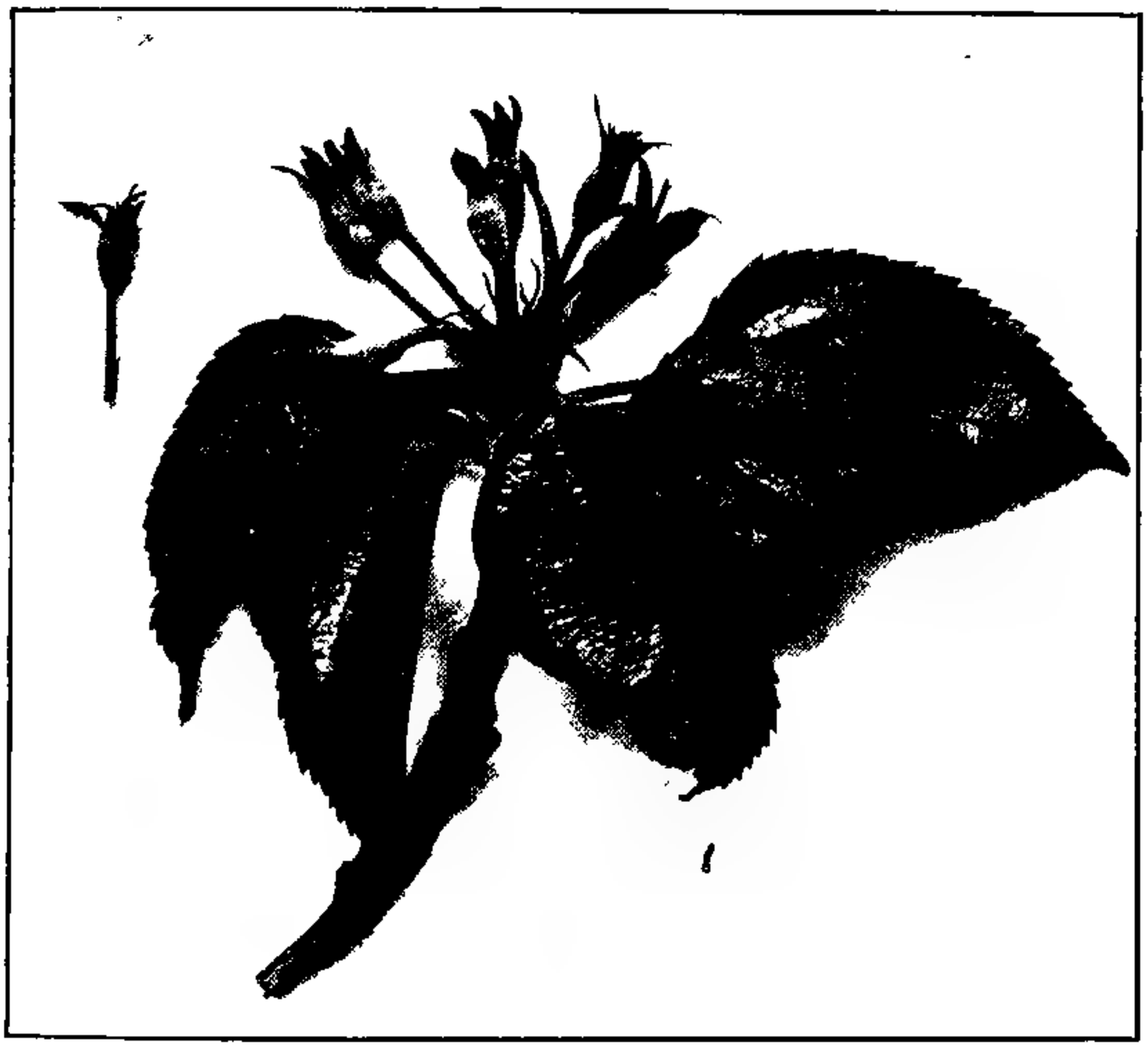

FIGURE 2. The flowers of the apetalous or navel apples have no petals and no stamens. Since the flowers are green, a tree of this type is sometimes erroneously called "bloomless." Green sepals are present and the number of styles is usually nearly double the normal number of five. With proper pollination some seeds will develop.

gree that has satisfied the standards of horticulture. In our vegetable fruits, however, some of the best of the eggplants, cucumbers, and tomatoes are seedless, or are at least near-seedless.

Plants bearing seedless or near-seedless fruits have arisen and will continue to arise as variations among the seedlings that are

grown. In general, our horticultural fruits have all been bred and selected for increased size, together with quality; and along with this development there has come very generally some reduction in the total number of seeds, or at least there is a greater proportion of pulp to the number of seeds than in the fruits of the wild progenitors. Compared with the wild ancestors, the present horticultural fruits are greatly increased in size, and their development is somewhat less dependent on the stimulus of seed formation. A seedless fruit is merely the last step in the evolution of the fruit as a vegetative structure.

Most plants which bear seedless fruits may be used as parents in breeding. Even seedless bananas produce some seeds to abundant pollination. The Gros Michel banana is very susceptible to the "Panama disease" but it is being crossed with bananas more resistant or immune in the effort to combine in the progeny both quality of fruit and resistance to disease. Seeds may be had rather abundantly from pineapples and from the Washington Navel orange by making proper cross pollinations. The seedless *vinifera* grapes have much good pollen and may hence be used as male parents, and the near-seedless grapes may also be used as female parents. The apetalous apples have no stamens and pollen but they will yield seed to proper pollination.

Probably all of us will agree today that a good hardy seedless grape would be highly desirable and valuable for culture in New York State. For 10 years The New York Botanical Garden has coöperated with the Horticultural Department of this State Experiment Station in a project of breeding which aims to develop hardy seedless grapes of high quality. At the present time the tender *vinifera* seedless varieties, Sultanina, Sultanina Rose, Sultana, Panariti, Black Corinth, and Black Monukka, have all been used as pollen parents in hybridizing with various hardy grapes. A considerable proportion of the seedlings from such crosses are tender and die in the nursery, but a few have been hardy and by continuing the work the total number of hardy seedlings obtained has increased.

Of the grape seedlings from this breeding which have already come into fruiting, one is of noteworthy promise.[3] The vine is

[3] Descriptions of this vine and a report on its parentage, illustrated by photographs, have been given as follows: A New Seedless Grape. Jour. N. Y. Botanical Garden **28**: 20–23. 1927. A New Hardy Seedless Grape. Jour. Heredity **19**: 316–323. 1928.

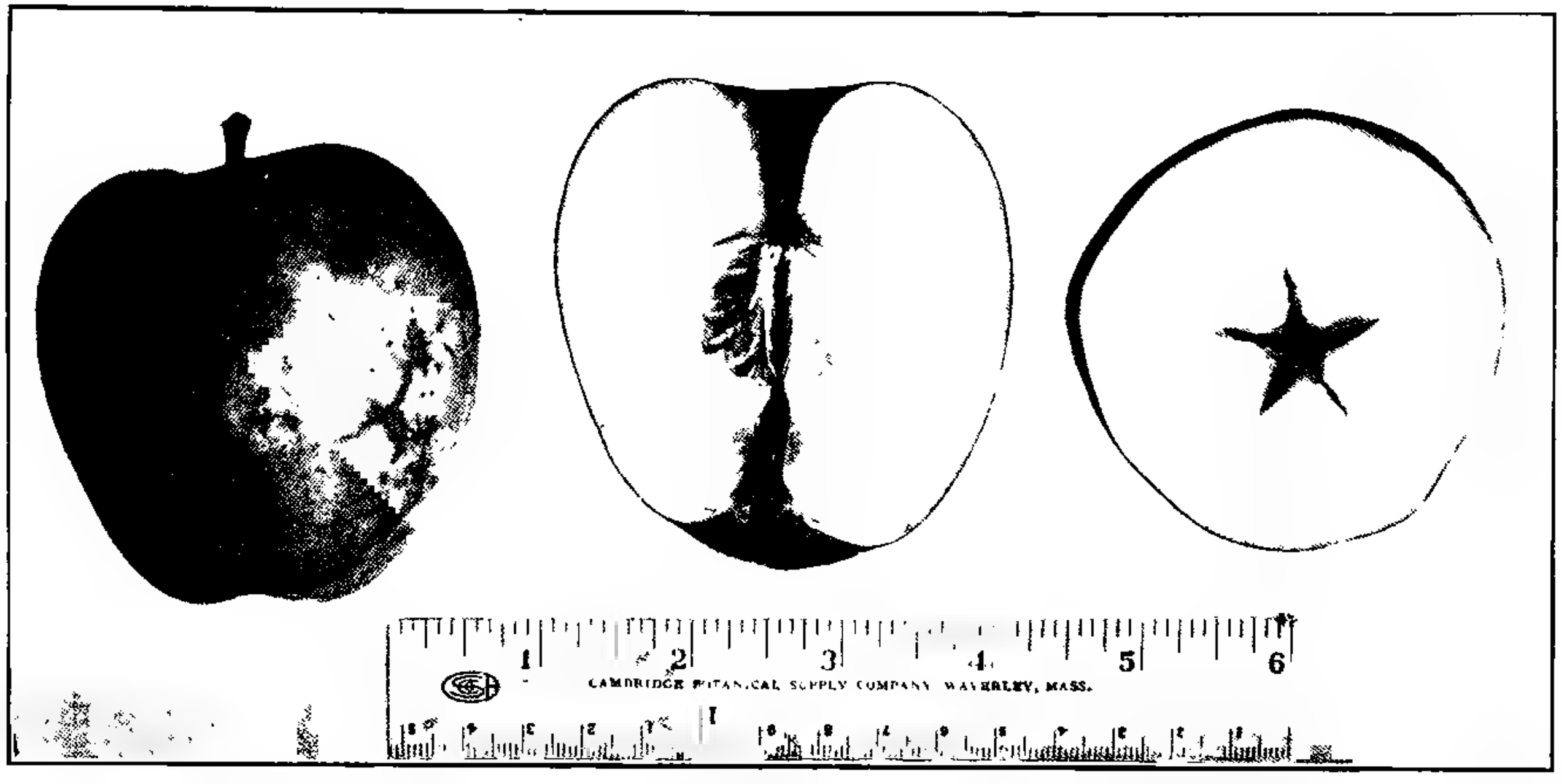

FIGURE 3. At least two clonal varieties of navel apples are now known. These differ in the color, shape, and quality of fruit, which indicates a distinct and separate origin of each. The fruits shown above are of the variety called "Wellington Seedless."

vigorous in growth, and it appears to be hardy here at Geneva. In its second year of fruiting it bore 13 clusters of fruit. The bunches are well-filled, strongly shouldered and the largest weigh at least a pound. The berries are greenish white, or yellowish when over-ripe, meaty, and vinous. The fruit is almost like that of the well-known Sultanina extensively grown in California. This year the parent vine was almost stripped of its flowers in using the pollen for further breeding so we are unable to exhibit today the best bunches which this plant is able to yield. We have, however, several clusters weighing from 8 to 12 ounces here on display. This vine is being propagated as rapidly as possible, and in a few years vines will be distributed for trial. There is every reason to believe that the methods we are using will give other seedless grapes with hardiness of vine and excellent quality of fruit.

Turning our attention to the tree fruits, it would seem that a good seedless apple would be a desirable acquisition to pomology. Seedless apples were known to the ancient Greeks and Romans and for at least 350 years there have been frequent references in horticultural literature to a curious apple which was reported to have no blossoms and to bear fruit without core or seed. At least two clonal varieties of such apples are now grown at this Station. The flowers are without petals or stamens, and are hence reduced almost to green branches. The fruits are often seedless, with more or less compressed seed-chambers, but seeds may be present. It is interesting and possibly important to note that the fruits are what we may call "navel apples." There is at the apex a small accessory or proliferated fruit of the same general nature as that seen in the navel orange. Here we have an excessive vegetative development of the main axis or stem of the flower. This characteristic may prove to be an important one in the development of seedless and parthenocarpic fruits. At any rate, it is one to which the breeders of pome fruits may well give special attention.

A fully parthenocarpic apple or pear, like the navel orange, would be self-fruitful even with no pollination whatever, and hence in growing it the pollination problem would be removed from the hazards of securing a crop of fruit. Possibly this character, already present to some degree in certain apples, may be developed further and combined with good quality, size, and pro-

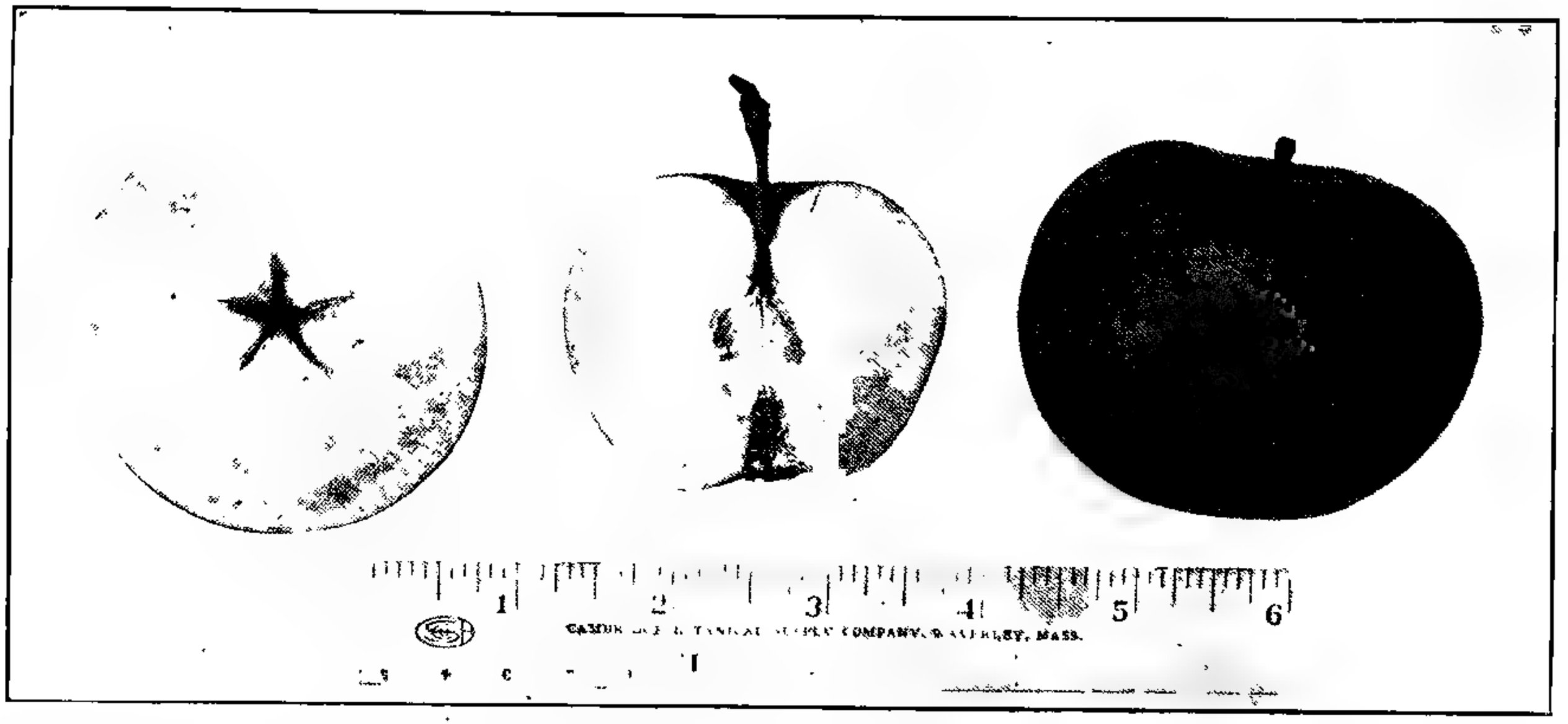

FIGURE 4. Fruits of the "Spencer Seedless" apple. In the fruits of the navel apples there is an accessory core above the main one and very fully coalesced with it. Its outlines are indicated by the course of the vascular strands, traced in the longitudinal section above, and by the rudimentary seed chambers which are present. In the main core of these fruits the walls of the seed chambers are fully developed, even though seeds are not present. In the ideal seedless apple the tough fibrous seed chambers would be greatly reduced or possibly eliminated.

ductiveness. Such fruits will be an improvement over the apple varieties of today at least in being self-fruitful. A study of the fruiting habits of these old clons of the apetalous or navel apples is being made here at this Station and also breeding work with them as seed parents is now under way here.

The references already made to the seedless grapes and the navel apples illustrate how seedless or near-seedless types of fruit which already exist may be used in breeding for further improvement. We should indeed like to know the exact procedure of nature's process in giving to mankind such splendid seedless fruits as the Gros Michel banana, the Washington Navel orange, and the Sultanina Seedless grape. Were these sudden and wide deviations, the " mutations " of modern genetical parlance, or are there some definite trends of development, or are there something like the so-called " complementary hereditary factors " which, if we understood their behavior sufficiently, could be combined in the production of seedless fruits? Undoubtedly, in the growing of all sorts of horticultural plants from seed many individuals that produce seedless or near-seedless fruits are being discarded and destroyed because the fruit lacks size, quality, or productiveness. But such plants may indeed prove valuable for use in selective breeding. The seed parent of our new hardy seedless grape already mentioned is a near-seedless individual that does not have bunches large enough to warrant propagation. Ordinarily it would be discarded and destroyed.

Little attention has been paid to the breeding of our fruit crops for seedlessness and we know very little of the inheritance of seedlessness in these plants. But a study of seedless fruits shows that there are various types of flowers and of fruits involved. It does not appear that there is one simple principle of development for all. In breeding these we need to understand how and to what extent each of them may be used in breeding, to use our best common sense in selecting parents and in judging the offspring, and to continue breeding unto the second and third generation, invoking as moral support the aid of the most useful of the theories of genetics.

The breeding of cucumbers conducted by Mr. Wellington, now of this Agricultural Experiment Station, and his associates has given results of special interest and of significance in relation to

the inheritance of seedlessness. Certain cucumbers, mostly English varieties used in hothouse culture, produce seedless fruits without pollination, but if there is pollination, seeds are produced. The fruits are hence parthenocarpic and the set of commercial fruit is not dependent upon insect or hand pollination. In the breeding work in question parthenocarpic and non-parthenocarpic varieties were hybridized and the progenies were grown into several generations by pedigreed breeding. There was much variation among the various generations in respect to seedlessness and other characters, but by selective breeding a fully parthenocarpic variety was again obtained. This variety, now named the Geneva cucumber, possesses certain qualities different from either of the parents used in the hybridization. Such results support the view that the character of seedlessness is hereditary and that hybridization and selective breeding is effective in combining seedlessness with highly desirable qualities from different parents or even with the expression of new qualities to give new clonal varieties of merit. That careful selection of parents with reference to good qualities in the crossing of seedless and near-seedless grapes may give new seedless varieties of special merit has also been demonstrated in our results with grapes.

It is unwise and certainly it is unnecessary to predict that seedless fruits will in time supplant the best of the seeded varieties in the fruits grown commercially here in New York State. On the other hand, it would be a lack of imagination on our part to insist that excellent seedless varieties are not possible in many of these fruits. Dame Nature has already provided many valuable seedless fruits among tropical and sub-tropical plants, and in most cases these have been propagated from ancient time. With the greatly increased knowledge of today regarding plant-breeding we should, it would seem, be able to help nature in the production of excellent seedless fruits valuable for temperate regions.

A. B. STOUT.

PALMETTO–WITH–A–STEM — SABAL DEERINGIANA

Field study has not increased the number of our native palms to the extent that it has added to some of our other genera, for example, *Iris* and *Opuntia,* but the rather recent discovery of two species of the genus *Sabal,* one in Florida and another in Louisiana, thus adding two native palms to the native species heretofore known in the continental United States is really a rather high percentage of increase.

The Florida palm referred to above, *Sabal Jamesiana,* has already been described in this journal.[1] Its geographic range has not been materially extended, but it has been found in several additional hammocks of the Everglade Keys. It grows in a thin layer of sand on a rock foundation, with more or less humus intermixed. Its nourishment is scant. This fact is reflected in a graceful palm with in no way great vigor or bulkiness.

On the other hand, *Sabal Deeringiana* grows in bottomless gumbo with copious nourishment, which is reflected in a very vigorous and bulky palm.

The tenth of April, 1925, was to become botanically a memorable day, for on it and almost simultaneously were discovered, as far as number of species and variety of color is concerned, the iris center of the world and a palm with a tall stout trunk in a country where only a trunkless palmetto (*Sabal minor*) was supposed to exist.

Several years ago in scanning literature for references to palms of the continental United States the following rather startling reference was stumbled on. "It is also in the lower portion of this belt [Coastal Plain of Texas] (where the palm tribe is represented by the *Chamaerops Palmetto*) that the Palmetto attains a growth as gorgeous even as in the lower Mississippi; it extends on the Rio Bravo [Rio Grande] up to about 80 miles from the gulf."

"In addition to the Palmetto common to the lower portions of these two great rivers, . . ."[2]

This reference to a gorgeous growth of cabbage-trees along the lower Mississippi River had usually been taken, to say the least,

[1] Journal of The New York Botanical Garden 28: 181–185. 1927.

[2] Arthur V. Schott, in Report, United States and Mexican Boundary Survey 1[2]: 44. 1857.

FIGURE 5. A medium-sized specimen of *Sabal Deeringiana* in the hammock several hundred yards back of the shore-line of Lake Pontchartrain, near Frenier Beach, about forty miles west of New Orleans. In this case the complete leaves have fallen from the stem, thus leaving a naked cylindric trunk. Spent flower-stalks (spadices) may be seen extending above the leaves. The tips of these have been broken off. The flower stalks are often fully twice as long as the leaves and bear myriad flowers and very numerous fruits.

as an exaggerated statement, even up to the spring of 1925. On the one hand the cabbage-tree (*Sabal Palmetto*) had not been collected or otherwise even been mentioned as growing within the one thousand mile stretch between Saint Andrews Bay in Florida to the mouth of the Rio Grande in Texas. On the other hand, even a copious growth of the dwarf-palmetto (*Sabal minor*) the only palm then known to grow naturally in the lower Mississippi delta would scarcely have been referred to as "gorgeous" by Arthur Schott or compared by him to the cabbage-tree.

Field-work in the lower Mississippi delta by the writer subsequent to the spring of 1925, has convinced him that the extensive engineering operations connected with the buildings of the levees along both banks of the river utterly exterminated the palm growth referred to by Schott. Arthur Schott[3] made his observa-

[3] Arthur Carl Victor Schott was born February 27, 1814, at Stuttgart, Wurttemberg. He was educated in his native city, and at the institute of agriculture in the neighboring village of Hohenheim. He then managed various estates in Germany, and was for ten years in charge of a mining property in Hungary. In 1848 he traveled through southern Europe, Turkey, and Arabia. In 1850, already an accomplished linguist, artist, and naturalist, he came to America, where he almost immediately made the acquaintance of Professor John Torrey, of New York. In the following year he was appointed a surveyor on the Mexican Boundary Survey, and in September, 1851, sailed from New York to New Orleans, and then proceeded overland, in company with C. C. Parry, to El Paso; from San Antonio, J. M. Bigelow was also a member of the party. Schott spent the entire year 1852 on or near the lower Rio Grande, with headquarters most of the time at Eagle Pass; some of his surveys were in a region never since visited by a botanist. At first he collected plants on his own account, but later he was officially authorized to collect not only plants but also specimens in other branches of natural history. After a few months, from February to April, in Washington and New York, he returned to the field in May, 1853, going overland to New Orleans and across country to the Rio Grande. Before the end of the year he was again in Washington, working on official reports for the survey. Late in 1854 he again took the field, at the western end of the Boundary, going by way of the Isthmus to San Francisco, and returning down the coast to San Diego, where he arrived about the first of November. Most of the year 1855 he spent along the lower Colorado River and in Sonora, and in 1856 and 1857 was at Washington, still connected with the Boundary Survey. Late in 1857 he spent several months with a surveying party in the Atrato River region of Colombia. After his return to Washington he remained in the employ of this survey commission until the completion of its report in 1864. From 1864 to 1866 he was in charge of an official geological survey

tions about the middle of the last century, while the extensive levee building occurred about the beginning of the last quarter of that century. It is evident that neither the engineers in charge of the levee work nor their associates were botanists, else some record additional to Schott's original statement would have found its way into print.

Had the study of our native palms been taken up seriously before the end of the first quarter of this century, this striking palm and its haunts would not have remained secret for three-quarters of a century after Arthur Schott gave the clue to their existence.

To meet with erect-stemmed palms hundreds of miles out of the known geographic range of any such plant was a great surprise. A first glance at the trees naturally suggested the cabbage-tree (*Sabal Palmetto*). A second glance indicated something quite different. This palm, although resembling the cabbage-tree in habit, is really related to the blue-stem (*Sabal minor*)—a giant blue-stem.

Arthur Schott, like several other botanists, made a bad guess concerning the identity of the palm in the delta of the Rio Grande in Texas by reporting it as the cabbage-tree (*Sabal Palmetto*). This Texan palm, since Schott's time referred to *Sabal mexicana,* and since this preliminary disposition of it described as *Sabal texana,*[4] is really a true cabbage-tree, distinct botanically from the classic cabbage-tree (*Sabal Palmetto*) but quite similar in habit. On the semi-circular coast line of the Gulf States we find two kinds of true cabbage-trees—*Sabal Palmetto* on the Florida Coastal Plain and *Sabal texana* on the Texas Coastal Plain. Although now widely separated geographically and morphologically, they may have sprung from a common ancestral type, and each may once have had a wider geographic range. Midway in this coastal region we find a palm of a quite different group of the genus *Sabal,* but with the general habit of the cabbage-trees. In

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for the state of Yucatan, and while there collected nearly a thousand plants. The remainder of his life was spent in the employ of various governmental bureaus in Washington, where he died July 26, 1875.—JOHN HENDLEY BARNHART.

[4] For a history of this palm see Journal of The New York Botanical Garden 28: 132–143. 1927.

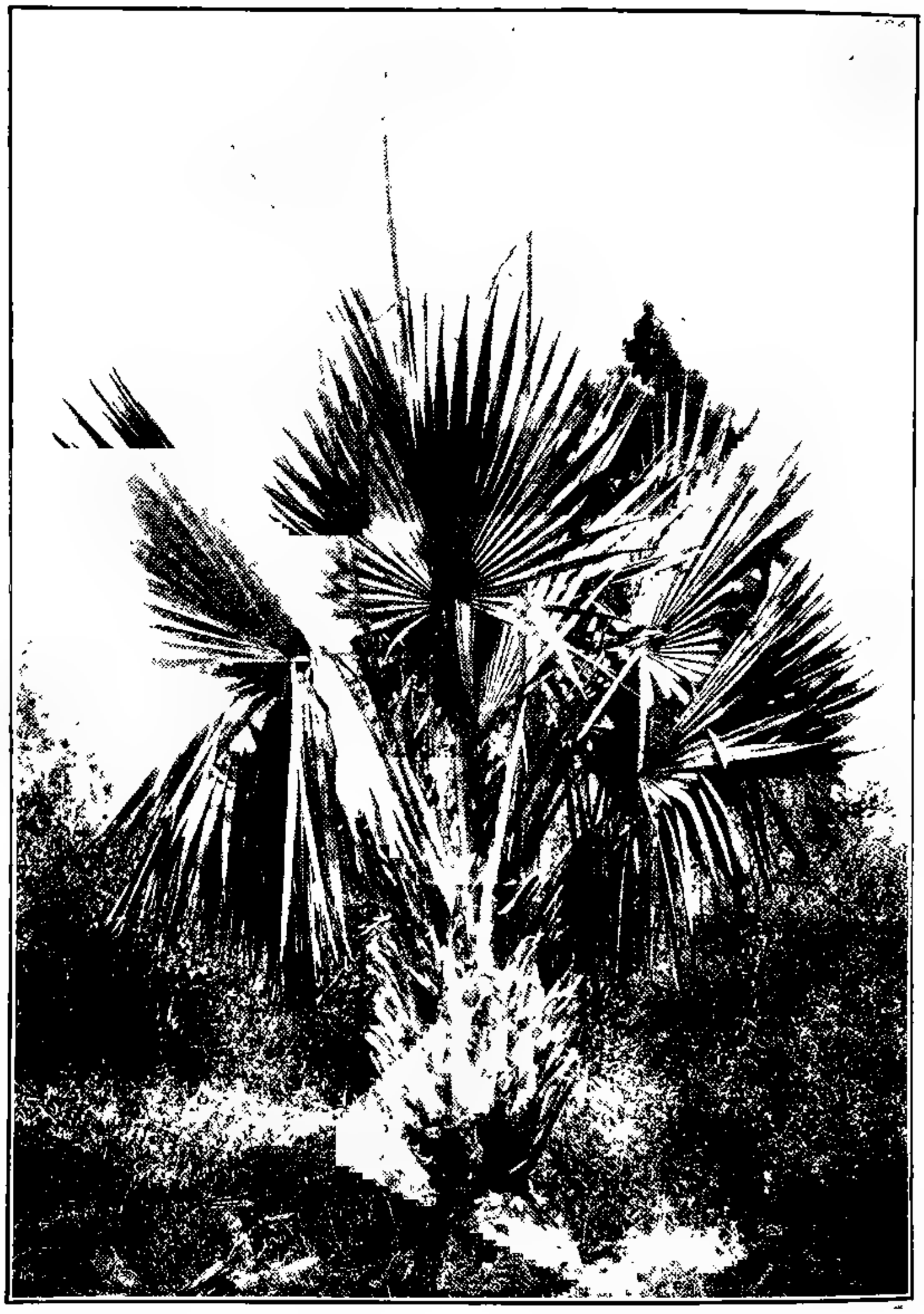

FIGURE 6. A medium-sized specimen of *Sabal Deeringiana* situated near the one shown in FIGURE 5. In this case the "boots," as the clasping leaf-bases are popularly termed, are persistent on the trunk. The great size of the leaf-blade is shown by a comparison of the drooping leaf-segment and the two-foot machette standing at the base of the trunk. The palm usually grows in places that are overflowed parts of the year. This plant grew in a lower spot than that shown in FIGURE 5, as is evidenced by the mass of roots which form about trunk bases where water stands for a considerable period.

addition to being intermediate in geographical distribution, this palm is intermediate in morphological characters as regards the true cabbages and the blue-stems[5] or dwarf-palmettos. *Sabal Deeringiana* is morphologically most closely related to *Sabal minor* by the erect leaves, the stiff erect leaf-lobes, the flat leaf-blades and the erect spadices, which exceed the leaves in length. On the other hand, it resembles *Sabal Palmetto* by the erect trunk with persistent or deciduous "boots," and the midrib, which extends into the leaf-blade for about one-third its diameter.

The two blue-stems—*dwarf* and *giant*—may have descended from the same ancestral palm. At the present time *Sabal minor* is the most wide-spread of our native palms, while *S. Deeringiana* is one of those with a very restricted geographic range. Where it originated we cannot tell. It has certainly migrated to its present haunts, for in its early history the present region it inhabits was sea instead of land. Like many other plants of the lower Mississippi delta, it has left no trace of its line or lines of migration.

The geographic limits of *Sabal Deeringiana* are not yet perfectly known. It grows in swamps and along bayous in the lower Mississippi delta. It has not been observed east of the Pearl River, nor west of the Atchafalaya River.

Sabal Deeringiana is one of the massive palms. Its success in eluding the eye of the botanist and the layman for over a century and a quarter seems nothing short of mysterious. That a palm with a massive trunk up to nearly two feet in diameter bearing a crown of numerous leaves with blades up to six feet in diameter and erect, feathery-branched flower-stalks up to eighteen feet long,[6] growing naturally in a well-settled region, even nearly or quite within the city limits of New Orleans, should have remained botanically undiscovered until Anno Domino 1925 seems surpassing belief. Yet more strange is the almost total ignorance of its occurrence by residents who have spent nearly their whole life in the region it inhabits. In answer to queries concerning the occur-

[5] Stem in this case refers to the leaf-petioles, not to the stem or trunk of the plant.

[6] The relative massiveness of the two blue-stems may be measured by the spadices, that of *Sabal minor* is of about the diameter of a finger at the base, that of *S. Deeringiana* about the diameter of a forearm.

rence of this palm within its geographic range, at least nine out of ten of those questioned will answer that they have not seen it. Occasionally one gets a reaction put this way, " Oh, you mean the palmetto with a stem " (or " trunk "). Hence we adopt this phrase as an English name and term *Sabal Deeringiana,* " Palmetto-with-a-trunk."

JOHN K. SMALL.

McKELVEY'S THE LILAC

A MUCH-NEEDED MONOGRAPH

The lilac season of 1929 has demanded a first view of the new lilac monograph[1] by Mrs. Susan Delano McKelvey. Previous seasons have caused the search for suitable references, to help in maintaining lilac collections, but the only aid of value was a long catalogue list of W. E. Marshall & Co., aided by other lists containing a few varieties not in the first. With the aid of this present work the collection of nearly 200 varieties in The New York Botanical Garden is being checked and revised. Horticulturally, the important points in such a monograph are the separation of the Giraldi hybrids, such as the early-flowering Lamartine, Mirabeau, Pascal, Descartes, and others, the distinguishing of the tree and the late-flowering species, the Chinese or Rouen, and the various other species which have been found to be parents of hybrids or which may be of use to the hybridists in the future. The main groups of the modern lilacs are varieties of *Syringa vulgaris,* a species of southern Europe. These have all been assembled for the first time in Mrs. McKelvey's monograph. About 500 names of varieties, mostly French of Lemoine origin, with a few others which have been taken into gardens such as Späth's excellent white variety, *Frau Bertha Dammann,* Koster's purple single variety *Hugo Koster* or the white single *Princess Alexandra,* which was introduced by Ellwanger and Barry, are listed under *Syringa vulgaris.* As the result of seven years' work Mrs. McKelvey has assembled all the available knowledge that has been published or could be secured by correspondence with various experts in this and other countries and has added uniform de-

[1] McKelvey, Susan Delano. The Lilac. 4to. Pp. I–XVI + 1–581. *pls. 1–171.* New York, 1928. The Macmillan Co.

scriptions with exact Ridgway colors for bud outside, open flower, and inside open flower, these to compare with designated colors on charts selected from the Ridgway plates and included in the volume, handy for use in the field. The New York Botanical Garden has changed the names of long-doubtful varieties, such as Godron (Godroy) and Mireille (Merveille), to conform to this list as corrected by Mrs. McKelvey and the varieties can now be checked from time to time by this comprehensive work. There are five or six single white-flowered varieties in our collection and six or seven double white ones, and it will be interesting to see how the nomenclature will work out on these so closely similar forms.

An even more intense study and more complete description and assemblage of botanical, historical and horticultural notes is presented by Mrs. McKelvey for the species. As an example, the Hungarian lilac *Syringa Josikaea* has more than two pages of bibliography, to say nothing of twenty-three pages of other interesting information about this species.

KENNETH R. BOYNTON

BROCKMANN-JEROSCH'S DIE VEGETATION DER SCHWEIZ

With the publication of the fourth part in March, 1929, the first volume of the Vegetation of Switzerland[1] is completed. The volume is devoted wholly to a careful and remarkably comprehensive exposition of the environment of the Swiss vegetation. The soils, of which numerous types exist, receive 66 pages of discussion, and 177 pages are devoted to the rainfall. In this the influence of the Alps is pronounced, both on the quantity and distribution of precipitation, which ranges from less than 600 mm. to more than 3000 mm., in general increasing with the altitude. Snow falls in all parts of the country and in the higher altitudes exercises a great influence on plant life. The next 142 pages

[1] Brockmann-Jerosch, H. Die Vegetation der Schweiz. Beiträge zur geobotanischen Landesaufnahme 12. Pages 499; 102 fig., 8 pl., 7 charts, 3 maps. Published by the Pflanzengeographische Kommission der Schweizerischen Naturforschenden Gesellschaft, Bern, Verlag Hans Huber, 1925–1929. Price 36 francs.

present the conditions of temperature. Low temperatures at high elevations set climatic limits to the altitudes reached by the flora, and it is interesting to note that Swiss plants may show injury or even be killed by too high temperatures. A discussion of the winds follows with 74 pages; local winds depending on the configuration of the mountains are an important feature and some of them, especially the *föhn,* are of considerable importance to plants. The volume closes with a series of indexes. The large maps showing the rain-fall, the height of the tree-line on the mountains, and the types of agriculture are very detailed and are excellent examples of the map-makers art.

H. A. GLEASON.

PUBLIC LECTURES DURING NOVEMBER

Following is the program of the free illustrated lectures given in the Museum Building of The New York Botanical Garden on Saturday afternoons, during November, beginning at four o'clock.

Nov. 2. "The Ten Commandments of Rose Growing," Mr. J. H. Nicolas, Rose Specialist.

Nov. 9. "New Plants and Flowers for Home Gardens," Mr. Kenneth R. Boynton, Head Gardener.

Nov. 16. "Chrysanthemums," Mr. Charles H. Totty, Nurseryman and Florist.

Nov. 23. "Frost and Snow Crystals," Mr. Wilson A. Bentley.

Nov. 30. "Bermuda," Dr. Fred J. Seaver, Curator.

NOTES, NEWS, AND COMMENT

Professor C. H. Ostenfeld, Director of the Botanical Garden at Copenhagen, Denmark, and Mrs. Ostenfeld, visited The New York Botanical Garden on October 17, as guests of Doctor and Mrs. Britton. Professor Ostenfeld is prosecuting investigations upon the floras of high boreal regions of Europe, Asia, and North America; he consulted, while here, with Doctor Rydberg concerning types of species from Alaska and British North America.

At a special 175th anniversary convocation of Columbia University, held on October 31, numerous honorary degrees were conferred, including doctorates on four members of the Board

of Scientific Directors of The New York Botanical Garden. The recipients and their citations, as given by President Nicholas Murray Butler, are as follows:

"Charles Peter Berkey, B.S., Minnesota, 1892; Ph.D., 1897, Professor of Geology—Finely following in the footsteps of Newberry and Kemp; truly was it forecast of him by Job of old:

Speak to the earth and it shall teach thee.....Sc.D."

"Marston Taylor Bogert, A.B., Columbia, 1890, Professor of Organic Chemistry—Lifelong teacher and leader of research in this university, carrying its message of scholarly helpfulness and distinction through numberless channels of professional association and communication at home and abroad, illustrating Pope's lines in all but the adjective:

The starving chemist in his golden views, Supremely blest .....Sc.D."

"Robert Almer Harper, A.B., Oberlin, 1886; Ph.D., Bonn, 1896, Torrey Professor of Botany—

No daintie flower or herbe that growes on ground,
No arborette with painted blossoms drest,
And smelling sweete, but there he might be found...Sc.D."

"Henry Hurd Rusby, M.D., University Medical College of New York, 1884—Professor of Materia Medica and Dean of the College of Pharmacy—Honored and respected head of his calling, who perhaps more than any other living man realizes that

—mickle is the powerful grace that lies
In herbs, plants, stones and their true qualities.....Sc.D."

Meteorology for September. The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: 97° on the 1st; *99° on the 3rd;* 88° on the 10th; 77° on the 16th; and 85° on the 26th. The minimum temperatures recorded were 65° on the 7th; 49° on the 12th; *40° on the 19th and the 21st;* and 46° on the 24th. The total precipitation for the month was 2.69 inches.

ACCESSIONS

LIBRARY ACCESSIONS DURING AUGUST, 1929, (CONTINUED)

HEER, OSWALD VON. *Beiträge zur fossilen Flora Spitzbergens. Gegründet auf die Sammlungen der schwedischen Expedition vom Jahre 1872 auf 1873 . . . mit einem Anhang . . . von Prof. A. E. Nordenskiöld.* Stockholm, 1876.

———. *Beiträge zur miocenen Flora von Sachalin.* Stockholm, 1878.
———. *Flora fossilis alaskana.* Stockholm, 1869.
———. *Fossile Flora der Bären Insel.* Stockholm, 1871.
———. *Nachträge zur fossilen Flora Grönlands.* Stockholm, 1880.
———. *Ueber fossile Pflanzen von Novaja Semlja.* Stockholm, 1878.

HÖLL, KARL. *Oekologie der Peridineen.* Jena, 1928.

ILTIS, HUGO. *Gregor Johann Mendel: Leben, Werk und Wirkung.* Berlin, 1924.

JANKE, ALEXANDER. *Allgemeine technische Mikrobiologie.* 1. Teil. *Die Mikro-organismen.* Dresden, 1924.

KISSER, JOSEF. *Leitfaden der botanischen Mikrotechnik.* Jena, 1926.

KLEIN, GUSTAV, & STREBINGER, ROBERT. *Fortschritte der Mikrochemie in ihren verschieden Anwendungsgebieten.* Leipzig, 1928.

KOSTYTSCHEW, SERGIUS. *Lehrbuch der Pflanzenphysiologie.* Vol. I. *Chemische Physiologie.* Berlin, 1926.

LEPESCHKIN, WLADIMIR. *Lehrbuch der Pflanzenphysiologie auf physikalisch-chemischer Grundlage.* Berlin, 1925.

LINDAU, GUSTAV, ED. *Kryptogamenflora für Anfänger.* Ed. 2, Vol. 3. *Die Flechten von G. Lindau.* Berlin, 1923; Vol. 5. *Die Laubmoose von Wilhelm Lorch.* Berlin, 1923; Vol. 6 [pt. 1]. *Die Torf- und Lebermoose von Wilhelm Lorch.* Berlin, 1926; Vol. 6 [pt. 2]. *Die Farnpflanzen von H. Andres.* Berlin, 1926.

———. Ed. 3, Vol. 1. *Die höheren Pilze von Eberhard Ulbrich.* Berlin, 1928.

LUNDEGÅRDH, HENRIK GUNNAR. *Klima und Boden in ihrer Wirkung aus das Pflanzenleben.* Jena, 1925.

LUNDGREN, SVEN ANDERS BERNHARD. *Om några växter från den Stenkolsförande Formationen i nordvestra Skåne.* [Lund, 1872.]

MARKGRAF, FRIEDRICH. *Kleines Praktikum der Vegetationskunde.* Berlin, 1926.

MELIN, ELIAS. *Untersuchungen über die Bedeutung der Baummykorrhiza.* Jena, 1925.

MÖLLER, FRIEDRICH ALFRED GUSTAV JOBST. *Der Waldbau; Vorlesungen für Hochschul-Studenten.* Vol. 1. *Ed. by Helene Möller & Erhard Hausendorff.* Berlin, 1929.

MÖLLER, HJALMAR AUGUST. *Bidrag till Bornholms fossila flora (Rhät och Lias). Gymnospermer.* Stockholm, 1903.
———. *Bidrag till Bornholms fossila flora. Pteridofyter.* Lund, 1902.

MOLISCH, HANS. *Im Lande der aufgehenden Sonne.* Wien, 1927.
———. *Pflanzenphysiologie als Theorie der Gärtnerei.* Ed. 5. Jena, 1922.

NATHORST, ALFRED GABRIEL. *Bilder ur forntidens växtverld.* Stockholm, 1877.
———. *Contributions à la flore fossile du Japon.* Stockholm, 1883.
———. *Die oberdevonische Flora des Ellesmere-Landes.* Kristiania, 1904.

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BRONX PARK, NEW YORK CITY

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Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK CITY